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EXTERNAL INSPECTIONS

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LIST OF ABBREVIATIONS

ABS – American Bureau of Shipping

AFS – Anti-fouling System Convention

AIS – Automatic Identification System

APCIS – Asia-Pacific Computerized System

ASA – American Shipmasters' Association

BIQ - Barges Inspection Questionnaire

BIRP – Burge Inspection Report Program

BMWP – Biological Monitoring Working Party

BPQ - Barge Particulars Questionnaire

BV – Bureau Veritas

BWM – Ballast Water Management

BWRB – Ballast Water Record Book

CBT - Computer Based Training

CCS – China Classification Society

CIC – Concentrated Inspection Campaign

CMIC – Caribbean Maritime Information Center

COC – Certificate of Compliance

COLREG – the Convention on the International Regulations for Preventing Collisions at Sea

CRS – Croatian Register of Shipping

DNV – Det Norske Veritas

DPA - Deputy Person Ashore

DWT - Deadweight

EEBD – Emergency Escape Breathing Devices

EEDI – Energy Efficiency Ship Index

EF – Excess Factor

EU – European Union

EULA – End User License Agreement

FFE – Fire Fighting Equipment

FIC – Focused Inspection Campaign

FLNG – Floating liquefied natural gas unit

FPSO – Floating production storage and offloading unit

FSRU – Floating storage regasification unit

GA – Green Award

GL – Germanischer Lloyd

GPG – General Policy Group

HAZMAT – Hazardous Materials

HCD - Human Centred Design

HRS – High Risk Ship

HSSE – Health, Safety, Security & Environment

IACS – International Association of Classification Societies

IAPH – International Association of Port and Harbors

IAPP – International Air Pollution Prevention

IBC – International Bulk Center

IBWMC – International Ballast Water Management Certificate

IEEC – International Energy Efficiency Certificate

IHM – Inventory of Hazardous Materials

ILO – International Labor Organization

ILO 147 - the Merchant Shipping Convention

IMDG - International Maritime Dangerous Goods

IMO – International Maritime Organization

IMSBC - International Maritime Solid Bulk Cargoes

IOPP – International Oil Pollution Prevention

IRS – Indian Register of Shipping

ISGOT – International Safety Guide for Oil Tankers and Terminals

ISM – International Safety Management

ISO – International Organization for Standardization

ISPS – International Ship & Port Facility Security Code

KPI – Key Performance Indicator

KR – Korean Register

KRI - Key Result Indicators

LOADLINES- International Convention on Load Lines

LR – Lloyd's Register

LRS – Low Risk Ship

LSA – Life Saving Appliances

MARPOL – International Convention for the Prevention of Pollution from Ships

MASS – Maritime Autonomous Surface Ships

MEPC – Marine Environment Protection Committee

MLC – Maritime Labour Convention

MoU – Memorandum of Understanding

NIR – New Inspection Regime

NKK – Nippon Kaiji Kyokai

NOV – Notice of Violation

NOx – Nitrogen Oxides

OCIMF – Oil Companies International Marine Forum

OHSAS – Occupational Health and Safety Assessment Series

OVID – Offshore Vessel Inspection Database

PI – Performance Indicators

PIF - Performance Influencing Factors

PRS – Polish Register of Shipping

PSC - Port State Control

PSCO – Port State Control Officer

PWOM – Polar Water Operational Manual

QMS – Quality Management System

QSCS – Quality System Certification Scheme

R.O. – Recognized Organization

RI – Result Indicators

RINA – Registro Italiano Navale

RS – Russian Maritime Register of Shipping

SEEMP – Ship Energy Efficiency Design Index

SIRE – Ship Inspection Report Program

SMS – Safety Management System

SOLAS – International Convention for the Safety of Life at Sea

SOx – Sulphur Oxides

SRP – Ship Risk Profile

SRR – Ship Recycling Regulation

SRS – Standard Risk Ship

STCW - International Convention on Standards of Training, Certification and Watchkeeping for Seafarers

STCW - Standards of Training, Certification and Watchkeeping

SWA – Stop Work Authority

TBT – Tributyltin

TKK – The Imperial Marine Association (Teikoku Kaiji Kyokai)

TMSA – Tanker Management Self - Assessment

TONNAGE - the International Convention on Tonnage Measurement of Ships

UN – United Nations

USCG – U.S. Coast Guard

USSR - Union of Soviet Socialist Republics

UWILD – Underwater Inspection in Lieu of Dry-Dock

VIQ - Vessel Inspection Questionnaire

VPQ – Questionnaire regarding Vessels Particulars

ABSTRACT

Maritime transport holds the largest and the most important share of world transport with a percentage of up to 90%. The main purpose of this dissertation is to analyze the external inspections which carried out in ships and ensure the safety of the vessel, the crew, the ports and the environmental protection and sustainability. The four main inspections are the TMSA, the Vetting, the Port State Control and the Classification Society. There is also a small reference to the Green Awards. Their combination or even each one individually has significant effects on the economy and the company's overall appearance. An important reference is the historical development of inspections and how they began to be implemented. Additionally, every kind of external inspection displays the required procedure to be followed and several elements. It is important to highlight that the TMSA and Vetting inspections correlate with the tanker ships and oil companies. On the other hand, the Port State Control and the Classification Society concerns all kind of merchant ships. It is known that the international literature lacks studies of the external inspections, but the researchers acknowledge is rich of studies that examine this kind of issue and explain the implementation in the shipping industry.

Key Words: Safety Management Systems, Performance Measurement, Continual Improvement, Port State Control, Memorandum of Understanding, Inspection, Clear Grounds, Detention, Classification societies, Certificates, Survey, Vetting, OCIMF, SIRE

ΠΕΡΙΛΗΨΗ

Οι θαλάσσιες μεταφορές κατέχουν το μεγαλύτερο και το σημαντικότερο μερίδιο των παγκόσμιων μεταφορών με ποσοστό έως και 90%. Κύριος σκοπός της παρούσας εργασίας είναι η ανάλυση των εξωτερικών επιθεωρήσεων που πραγματοποιούνται στα πλοία και η διασφάλιση του σκάφους, του πληρώματος , των λιμανιών και της περιβαλλοντικής προστασίας και βιωσιμότητας. Οι τέσσερις βασικές επιθεωρήσεις είναι το TMSA, το Vetting, ο Κρατικός Έλεγχος του Λιμένα (PSC) και ο Νηογνώμονας. Υπάρχει και μια μικρή αναφορά στα Green Awards. Ο συνδυασμός τους ή και το καθένα ξεχωριστά έχει σημαντικές επιπτώσεις στην οικονομία και τη συνολική εμφάνιση της εταιρείας. Σημαντική αναφορά αποτελεί η ιστορική εξέλιξη των επιθεωρήσεων και το πώς ξεκίνησαν να υλοποιούνται. Επιπλέον, κάθε είδους εξωτερική επιθεώρηση παρουσιάζει την απαιτούμενη διαδικασία που πρέπει να ακολουθηθεί και διάφορα άλλα στοιχεία. Είναι σημαντικό να τονιστεί ότι οι επιθεωρήσεις TMSA και Vetting συσχετίζονται με τα δεξαμενόπλοια και τις εταιρείες πετρελαίου. Από την άλλη, ο κρατικός έλεγχος λιμένα και ο Νηογνώμονας αφορούν κάθε είδους εμπορικά πλοία. Είναι γνωστό ότι η διεθνής βιβλιογραφία στερείται μελετών για τις εξωτερικές επιθεωρήσεις , αλλά υπάρχουν αρκετές μελέτες που εξετάζουν αυτού του είδους τα ζητήματα και εξηγούν την εφαρμογή στη ναυτιλιακή βιομηχανία.

Λέξεις-Κλειδιά: Συστήματα Διαχείρισης Ασφαλείας, Μέτρηση Απόδοσης, Συνεχής Βελτίωση, Έλεγχος Λιμένα, Μνημόνιο Κατανόησης, Επιθεώρηση, Κράτηση, Νηογνώμονες, Πιστοποιητικά, Αξιολόγηση

INTRODUCTION

The main aim of this Master's dissertation is to examine, analyse in depth and provide information about practical issues regarding the Shipping Industry. The main aspects analysed are Tanker Management Self – Assessment (edited by Mr Konstantinos Stathoulopoulos), Vetting (edited by Mrs Vasiliki Linardou), Port State Control (edited by Mrs Eirini Chounta), and Classification Societies (edited by Mr Dimitrios Papatheofanous).

During the past decades a continuous development has been observed in the shipping industry. Especially, the last fifty years the maritime transportation demand has been skyrocketed. This sharp rise brings hopeful prospects and eventually positive results globally. This rapid growth favored the economies of many countries to develop and to be competitive in the shipping industry, providing better services. But this huge flourishing entails a lot of threats and risks for the shipping industry like oil spills, environmental pollution, work accidents or collisions, and many more. After some serious accidents, the people of shipping turned their attention to maritime safety and started to investigate how they could improve the process of shipping transportation, to protect seafarers' health and especially the environment. All this research resulted in the creation of TMSA, Vetting inspection, Port State Control inspections and the Classification societies.

The need for more effective estimation of risk has contributed to the establishment of TMSA. TMSA estimates the level of risk according to KPIs and includes four levels of estimation. It is consisted of 13 elements, which cover a range of risky issues that are met in Shipping Industry (from the management of human capital to environmental issues, for example). The outcome of TMSA should be analyzed by each shipping company, and according to the analysis, measures related with Performance Measurement and Management must be taken. Detection and prevention methods should also be implemented in order to identify the human errors, which are the primary cause of accidents and risk increase in Shipping Industry.

In maritime shipping industry a growing number of independent organizations, international governmental organizations and companies are taking initiatives to eliminate oil spills incidents. Today international legislation has become stricter for the tanker industry. IMO of UN enforced the MARPOL which entered into force in 1983 and includes regulations regarding the construction and operation. Besides this, international community trying to support the elimination of oil spill pollution and the enforcement of huge fines by the government courts introduced several inspection initiatives such as Vetting.

Following the previous two types of inspections, Port State Control comes to complete the external inspections to help with preventing and protecting the environment and human life. Through the PSC inspections, port authorities try to recognize and catch the substandard ship which are considered dangerous. Thus, several MoUs were established to support this project. Well trained inspectors carry out the initial inspection and, depending on the findings, proceed to a more detailed or not. In any case is necessary to inform the company, the recognized organization and the flag. There are specific procedures for the inspection, the master and the company.

A classification society ensures that the technical condition of a vessel and its equipment meets all aspects for safe trading across the globe. It contributes to the prevention of marine pollution and ensures that the safety of life at sea is preserved. To achieve its scope, classification societies develop rules in line with International Maritime Conventions. A vessel classed under a specific Classification Society shall at any time complies with its rules. The verification of a vessel’s compliance with the rules and regulations is managed through Classification surveys and validated with relevant certification.

Firstly, the ISO standards are analyzed at the same time with significant for the shipping safety conventions (STCW Convention, ILO Convention etc.). In addition, the safety management systems are defined, which are considered as the basis for the establishment of TMSA. After the analysis of these fundament principles, TMSA elements are referred and analyzed. Comparisons of all the TMSA editions are analyzed too. Having considered the significance of TMSA, the requirements for the successful implementation are analyzed with an emphasis to Performance Measurement and Management. Finally, in the last section of this chapter a survey is conducted to draw conclusions regarding the TMSA, how it works in Shipping Industry and examples of KPIs calculations used in TMSA are presented.

In the second section, an analysis in Vetting Inspections follows. Firstly, follows an introduction about the rise of the oil spill accidents and the implications to the marine environment. Secondly follows an analysis of Vetting Inspections from OCIMF organization. More specifically, SIRE and OVID inspection are examined in detail approach and introduce the reader to strict guidelines need to be followed by tanker companies today. The goal of SIRE and OVID inspections is to reduce the repetitive inspections in the same ship by developing an online database were submitting companies and charterers can have access to. In addition, those inspection motivate companies to develop a safety management plan and conduct all appropriate quality changes to avoid marine pollution incidents. Ships that do exceptionally well in vetting inspections and are certified will attract more potential charterers. Thirdly it is mentioned that charterers such as those from Chemical Distribution Institute (CDI) (BP, SHELL, EXXON VALDEZ) conduct inspection as well in order to assess the suitability of a ship. Last but not least, follows a separate analysis of the Green Award Organization. Green Award is a non-profit international organization that is worth to be mentioned for his contribution in maritime safety. In this section is examined the certification procedure of GA as well as the benefits gained by a certified member of the organization.

At the third part in the dissertation is analyzed the Port State Control Inspections. The historical background that led to the implementation of these inspections is referred to at the outset, followed by the nine Memoranda of Understanding and the USCG which are applied worldwide. Equally important are the databases and the factors that influence these inspections and have a significant role in the performance of PSC inspections. The types of inspections and the procedure is following, afterwards. Additionally, the report of the process is mentioned. The most important part of the inspections is the reference to the deficiencies and the detentions and their detailed analysis. Also, a brief reference is made to the procedures followed by the Masters and the companies.

In the following chapters, each classification society will be presented from its formation to today’s role in maritime industry. International Association of

Classification Societies' (IACS) mission and values will be described. Furthermore, the classification procedures from the assignment and maintenance to withdrawal and suspension of class will be analyzed and the categories of the class surveys will be explained. Lastly, the statutory certificates will be listed, and a summary of inspection items will be cited in order to issue each statutory certificate.

CHAPTER 1: TANKER MANAGEMENT SELF-ASSESSMENT

(Edited by Konstantinos Stathoulopoulos)

1.1.1 THE ISM CODE

The main aim of the ISM Code is to promote the implementation of the standards and procedures that are required for the operation of the shipping companies and ensuring that the safety of the human life in the sea, the environment protection and the safe daily operation both of the vessels and the office ashore. Under this context, the shipping company must provide a safe working environment for all the personnel and estimate the possible hazards resulting from the daily operations. Furthermore, under ISM Code the improvement of the personnel’s skills and their development must be ensured with the appropriate procedures. The ISM code has been developed, as many studies have highlighted the role of the human factor and its impact to the risks provoked. It is noticed that most of the accidents are provoked by the human factor. For this reason, a system of rules, standards and procedures has been recorded. For example, the vessels are subject to frequent changes in the legislation and the vessels’ technology. If the technology changes promote more the automation and reduction of the number of the seafarers, then the impact to the safety and the effectiveness must be estimated. It is possible that the reduction in the vessel’s personnel may have negative impact to safety and daily operation. The ISM Code is based more on: prevention, estimation of the possible causes to the safety problems, acknowledgement of personnel’s roles and vessel’s characteristics that are related with the procedures that must be implemented. The ISM code covers the organisation and the measures that must be recommended by the shipping company to reduce the hazards and the safety level to increase. It is consisted of two sections: the first section describes the implementation and is consisted of 12 detailed elements for the implementation of the policies and the second section is referred to the types of the required certificates and the verification.

1.1.2 OCIMF & SIRE

(OCIMF) is an association of oil companies, which are specified in the shipment of oil and gas. Companies that are related with oil exploitation, production and shipment may be members of this association. The organization publishes different editions with recommendations of measures to be taken, advices and ways for the effective implementation of SMS. SIRE was firstly launched on 1993 and has been determined as a tanker risk management tool, which was used by several counterparties, to enhance the shipping safety. SIRE system is a large database including information regarding operations of tankers and barges. Especially, OCIMF has focused on the effective implementation of the procedures according to the safety policies and standards. SIRE system is consisted of: Vessel Inspection Questionnaire (VIQ), Barges Inspection Questionnaire (BIQ), Uniform SIRE Inspection Report, Vessels Particulars Questionnaire (VPQ), Barge Particulars Questionnaire (BPQ), and these features, which have been established to convert the SIRE program to a more user-friendly edition for the operators and the companies. It is increasingly used by the oil industry in order to ensure that the vessels operate under the safety rules and policies imposed by the legislation and the organization.

1.1.3 ISO STANDARDS

ISO standards, such as ISO 9001 or OHSAS 18001, have greatly influenced the way in which human capital is managed in shipping. In particular, the IMO in its regulations includes specific provisions and tools which are related exclusively to human capital and its security. These conditions and regulations have a huge impact as well as positive effects on the security and management of human capital.

1.1.4 THE STCW CONVENTION AND THE HUMAN FACTOR

In 1978 the IMO introduced the STCW Convention to ensure minimum safety standards for seafarers. Since the establishment of this convention and after, there have been continuous upgrades, most recently the upgrade of the convention in 2012, while the most important upgrade took place in 1995 when stricter criteria for crew training were established. In particular, this amendment was intended to introduce uniform training, assessment and certification of seafarers' knowledge, while it also aimed to introduce special provisions that would prove that each seafarer has all the necessary knowledge and skills in matters concerning the handling of equipment on board, but also how to respond to emergencies. The establishment of this contract was quite important, as it was the first step in establishing the necessary safety standards for seafarers. At the same time, the IMO in 1997 adopted the human factor in management and safety standards, an element that affects maritime safety, and is also related to the activities of seafarers and workers on land. The human factor is the element that will greatly contribute to the successful improvement of safety and management standards and the implementation of IMO regulations and conventions, through the ongoing training of those directly involved, as it is a fact that the majority of accidents at sea due to human mishandling.

1.1.5 ILO CONVENTION

A new convention was concluded in 2006 by the ILO, an international organization that aims to reduce social imbalances, protect workers, and improve working conditions. This contract established minimum age limits for seafarers to work, significantly improved working conditions through the obligatory conclusion of an employment contract, the observance of specific working hours, provided medical coverage to seafarers and social security. In addition, the living conditions of the workers on board have improved considerably.

1.1.6 ISO 9001 & OHSAS 18001

The ISO 9001 management standard analyzes the requirements that a shipping company must meet in order to develop an efficient quality control system, which ensures customer satisfaction, complying with the conditions imposed by the framework. In addition, the company should have established procedures, in which the crew and employees are involved, in order to deal with special situations concerning both the environment and safety. The OHSAS 18001 management model was developed in 2007 with the aim of creating a widespread and accepted health and safety management system, thus helping to reduce risks in the work environment. This standard will soon be replaced by ISO 45001. Specifically, OHSAS aims to reduce the risk in the workplace, informing employees of the potential risks they face during work, while providing protection against an accident at work. Some of the main features are: the assessment of workplace safety measures, the predetermined procedures to be followed during ship repairs, and the instructions for work under specific procedures and control. The introduction of OHSAS came to cover the shortcomings that had been observed in terms of compliance with the provisions of the institutional framework, the implementation of safe operating procedures, the evaluation of safety policies by conducting risk assessments and the safety training of seafarers.

1.1.7 ISO 14001 & ISO 50001

ISO 14001 has its main objective to specify the requirements that are requested for an environmental management system, and therefore the organization can monitor more effectively the environmental performance. ISO 14001 has a significant contribution to the implementation of environmental management systems in the shipping industry. Shipping companies need to establish a life-cycle perspective when environmental aspects are taken into consideration. The EMS has similar procedures and has similar importance as the Safety Management System to ISM. The EMS should refer in detail on how the company's management will commit the company toward the environment. If the organization wishes to complete its aims and be compliant with environmental legislation, management's meetings must be held to estimate the situation, management should set targets- KPIs, related to environmental discharges, and frequent visits to the vessels by the management to ensure that their operation are compliant with the environmental policies. All of these policies followed by companies to measure the environmental performance, are analysed further in TMSA elements. ISO 14001 procedures are related with: complying with rules, regulations, guidelines and special practices, promoting and enhancing the personnel's feeling and confidence to participate to environmental actions.

ISO 50001 was introduced by ISO in June 2011 mostly for the shipping companies. It is modelled based on Quality Management System (QMS), trying to improve the energy management system and the energy performance. Improvement of environmental performance is not a requirement of ISO 50001. The requirements that are essential for the effective implementation of ISO 50001 are: the Management responsibility, the suitable energy policy, an effective energy action plan, correct implementations and operations, the conduction of performance audits and the management review.

1.2.1 SAFETY MANAGEMENT SYSTEMS

Each shipping company must introduce and implement a safety management system, which ensures that each shipping company is consisted with the rules and procedures, implemented in the shipping sector, and the operational requirements of these systems must have a relation with: policies for the safety and environment protection, directions and procedures ensuring that there is a safe operation of the vessels according to the national legislation and flag state's legislation, satisfied roles – responsibilities assigned to the personnel, procedures for the reference of accidents between ashore and onshore personnel, procedures for readiness preparation in case of special and emergency situations and the procedures of internal – external audit. The daily risks and situations of emergency that are faced daily in the shipping sector have contributed to the need of establishment of legislation and measures that will contrive to the risk management and hedging of the risk. One of these measures that have neem used and recommended are the safety management systems. In addition, the safety management systems are required to encourage the improvement of the safety standards in the shipping sector and use effective safety management systems to hedge the risk. SMS include all the essential procedures to ensure the safety in each action takes place in the sea. All the merchant vessels must comply with the requirements of SMS. A SMS provides details and information about the vessel's daily operations, the responsibilities of the crew in case of emergency, and how the training of crew is conducted. Typically, a SMS is divided into the below sections (Raunek, 2021):

- "General
- Safety and environmental policy
- Designated person
- Resources and personnel
- Master's responsibilities and authority
- Company's responsibility and authority
- Operational procedures
- Emergency procedures
- Reporting of accidents
- Maintenance and records
- Documentation
- Review and evaluation"

Especially, a SMS follows a standard procedure which is the below:

Figure 1: SMS Standard Procedure (Raunek, 2021)

- Step 1 – Plan

A new statement is required in SMS as a policy regarding the organization's approach.

- Step 2 – Do

A SMS should specify the organizational structure. In particular, the organisation must record the specific risks that will be faced in the future.

- Step 3 – Check

Procedures should be implemented for monitoring safety performance. Furthermore, this step is required for evaluating healthy and environmental performance. This stage is not limited only in this category but also could provide new actions and procedures in case of emergency (for example an accident).

- Step 4 – Act

This step includes review and the action according to the information that has been collected.

An effective SMS is required to achieve HSSE excellence. Operational Excellence is the Health, Safety, Security and Environment (HSSE) industry, is an element attempting to ensure sustainable improvement of KPIs.

The satisfied development and implementation of the SMS will drive to the issue of new certificates: Document of Compliance & Safety Management Certificate, which last for 5 years and will be subject to continuous estimation. It must also be referred that the SMS includes procedures and directions which must be up to date and are accessible by all the personnel. DPA is responsible for whatever has a relation with SMS, for example for the checking and verification of the appropriate implementation of the SMS. For this reason, DPA must have strong relationships with the upper management, ensuring with this way the provision of the requested support for the implementation of the SMS. The implementation of the SMS is based on many elements such as: personnel, the vessels and the equipment, and the procedures.

1.2.2 FACTORS FOR THE DEVELOPMENT OF SMS

The design and implementation of SMS is highly significant for the implementation of ISM Code. The factors that can contribute to the effective implementation of a SMS are the below:

- The commitment of the management for the changes and improvements that may contribute to the development of safety culture in the company
- Appropriate education and training must be provided to the personnel for the development of new skills
- Effective interaction and communication between the vessel and the office
- Establishment of new culture which will contribute to the adoption of new improvement standards
- Continuous control over issues that may occur due to cultural differences between the members of the teams
- Support provision and enhancement of relationships between the crew and office employees, given that the element of interpersonal confidence has a positive impact to the implementation of safety culture

1.3 SAFETY CULTURE IN SHIPPING INDUSTRY

In ISM Code there is not a clear reference for the definition of the safety culture. However, the development and the promotion of the safety culture is highly significant for the successful implementation of the SMS. The design and implementation of the SMS without a safety culture will create problems in the consistency of the procedures. Moreover, the deficit of safety culture encourages the complacency and contributes to the misinterpretation of the rules and procedures. The safety culture is described as the common values and ideas which interact with the structure of a company, auditing the SMS procedures so as to create new behaviour standards for all the personnel. The safety culture is a part of the company's culture, which means that the prominent company's culture has an impact to the company's growth. A significant prerequisite for the promotion of the safety culture is the development of informed culture, which demands that the personnel have the appropriate knowledge to handle and operate the systems. If this kind of culture is accomplished, then the reporting culture must be accomplished, which ensures that information relative to the safety is concentrated and summarized. The third kind of culture that can be accomplished is the just culture, prerequisite of which is the confidence environment and the understanding of the personnel of what is the mean of the acceptable or unacceptable behaviour. In shipping companies that there is a safety culture all the personnel act and behave according to the idea of the safety. It is very significant for all the employees to understand and incorporate the safety culture, because the written procedures and rules may not ensure the safe operation of the vessel and the company of course, if there is not commitment of the employees that will follow the established culture and work according to the safety standards.

1.4.1 DEFINITION OF TMSA

In the past the oil trading companies used the vessels emphasizing only to vetting procedures, according to which the companies decided if they would charter the vessel or not. In order the procedures of inspections to be more effective, the OCIMF members decided on 1993 the establishment of Ship Inspection Report Program (SIRE) and on 1997 the establishment of a new procedure of inspections, according to inspection protocol, which is determined by a total of documents. The importance of the outcome of TMSA is huge as the capability of the vessel to complete a voyage is affected by these metrics. Although TMSA is implemented mostly in tankers vessels, they are designed to be used in other shipping sectors. Particularly, TMSA estimates the level of risk according to some metrics – KPIs that are used and includes four levels of estimation. Level 1 is the minimum level and there are other three levels which contribute to the increase of best practice guidance. There are different kinds of editions for TMSA, which are evolved year by year. TMSA will continue to evolve and new KPIs will be added to ensure with this way the high level of safety. Practically, TMSA procedure consists of a book, an online tool, and a database, which is used for creating reports. SIRE is one of the initiatives introduced by OCIMF and is a tanker risk assessment tool. TMSA is included in the category of MSA, which is a tool created and developed by OCIMF to assess management systems risks against industry best practices. Each MSA consists of elements, used for the performance calculation and these consist of a range of questions, related with each element. These stages indicate the standard of management that the company is operating at, for example the higher the stage the higher the standard. When the elements and the stages for each MSA are determined, then a great range of questions are answered according to the determined KPIs, which show the final performance and assessed against best practices. The levels that are achieved for each stage are then calculated so as to have the overall performance of the MSA. Especially, MSA for Tanker Vessels, is consisted of 13 elements and the performance – risk can be calculated according to different KPIs that are defined in each element. The results of this estimation show us a clear summary of the performance, gaps are identified and through these, actions may be suggested to enhance the performance.

1.4.2 TMSA EDITIONS

There are many editions of TMSA, with the most recent the edition 3. Edition 3 (2017) has included many updates comparing to the TMSA edition 2, published in 2008. This edition had new updates and changes as it included updated guidance based on the experience from OCIMF members, vessel operators and other Industry Organisations. It also provided consistency with the market practices and encouraged in a high level the use of this programme by tanker vessel operators, including small coastal vessels and barges. In TMSA edition 3 the below elements have been added:

- Introduction of new requirements
- Changes in element 6 and element 6A. Addition of new KPIs
- Changes in element 10. New edition includes the OCIMF Energy Efficiency and Fuel Management paper, which is not included in edition 2.

- Introduction of new element 13

TMSA 3 expands the safety levels compared to TMSA editions 1 & 2 by adopting a not so much deterministic approach as adopted by the previous editions of TMSA. In specific, the previous editions of TMSA through the deterministic approach they had, tried to ensure the minimum level of compliance to the safety rules, without a provision for Human Factors and Behavioural Safety. There are 266 KPIs in TMSA 3 edition. The main differences between TMSA 2 & TMSA 3 are mainly the below (Antonis Iordanidis, 2017):

- Specialized questions of oil producers have been incorporated to the new edition
- Some KPIs have been shifted to lower stage
- There is more analytical description of best guidelines for each stage, ensuring higher clarity for each stage
- New legislation has been incorporated to the stages.

Consequently, there are many updates which have contributed to a high-level frame, under which TMSA works today.

1.4.3 TMSA ADVANTAGES

The introduction of TMSA tool offers many advantages to the vessel operators, some of them are the below:

- KPIs are offered, which help in a high level to the risk estimation, and further guidelines are offered according to each stage of the assessment
- New objectives are determined, according to the best practices, described for each stage
- TMSA applies only to the company's management according to management standards
- Estimation of the risk and performance is accomplished according to quantified criteria, after an extended market research
- TMSA gives opportunities to each member of OCIMF to charter vessel's operators, who have succeeded high overall performance in the assessment and provide high safety standards and practices about protection of environment.

Therefore, TMSA is defined as systemic, methodical, motivated, and highly structured in its process. It is a significant assessment tool of vessel's operator and offers guidelines to meet the requirements of each element.

1.4.4 CONTINUAL IMPROVEMENT

TMSA elements are designed to help companies improve the SMS. This can be completed through the below steps:

- Plan

Companies must set reliable, effective plans that will be completed in a short-term period. In addition, responsibilities must be assigned to appropriate persons who will have the knowledge, ability, and experience to complete the plans and objectives, that have been sat.

- Act

Personnel must act and complete all the plans effectively, with a few errors as possible as it can be. Policies and procedures must be communicated to personnel to have knowledge of how the company operates at normal and special cases.

- Measure

Company evaluates the outcome of previous stage and searches for any gaps or changes may result from the activity

- Improve

At this stage new actions and targets are defined to lead to improvements. Plans should be adjusted to incorporate the measures which have been suggested at the previous stage.

1.5. KPIS AND PERFORMANCE MANAGEMENT SYSTEMS

1.5.1 A PERFORMANCE MANAGEMENT SYSTEM

Performance management is used to review a decision related to training and career development aspects and set clear and specific performance expectations, providing feedback for the employee's performance compared with the goals that have been assigned. Nowadays, the performance management focuses more on feedback provision and coaching, rather than a classic paper tail. The performance management is primarily linked with other organizational systems like:

- Strategic planning: This system is used mainly for the assessment of the working conditions and whether the company attracts and retains talented employees
- Total compensation: Many companies use performance management systems to determine the compensation processes, based on personnel's performance
- Individual and team development: A plan of individual and team development is used as a final step of the procedure to assist in goal setting individual and team development, which will enhance employees' career and professional development
- Succession Planning: The analysis of performance data is highly significant for the organization's planning for a long term period and the current structure of the organization.
- HR Technology systems: Many organizations use new systems to evaluate personnel's performance, and review goal setting

Companies have the ability to prevent many problems by ensuring that a daily and interactive communication between managers and employees resulting in a complete understanding of what is required, which are the problems and how measures should be taken. Their relationship should be based on cooperation, coordination, focussing at the same time on the organization's goals. An effective performance management system is consisted of a range of elements like: Goal setting, performance review, and performance improvement plans. The estimation and detection of possible hazards and improvement needs is conducted through performance management systems and according to predefined KPIs.

1.5.2 PERFORMANCE MANAGEMENT IN SHIPPING INDUSTRY

Many procedures have been designed and developed by Shipping Operators to evaluate the performance of the company both onshore and ashore. However, procedures for the evaluation of performance of vessels during their daily operation is significant too. The most common procedures evaluating the vessel's performance, are these that measure the daily fuel consumption and the daily distance covered, for example. Under this procedure the daily mean power and mean speed may be calculated. An example of this procedure is explained in the below diagram, where metrics of the vessel's performance are compared:

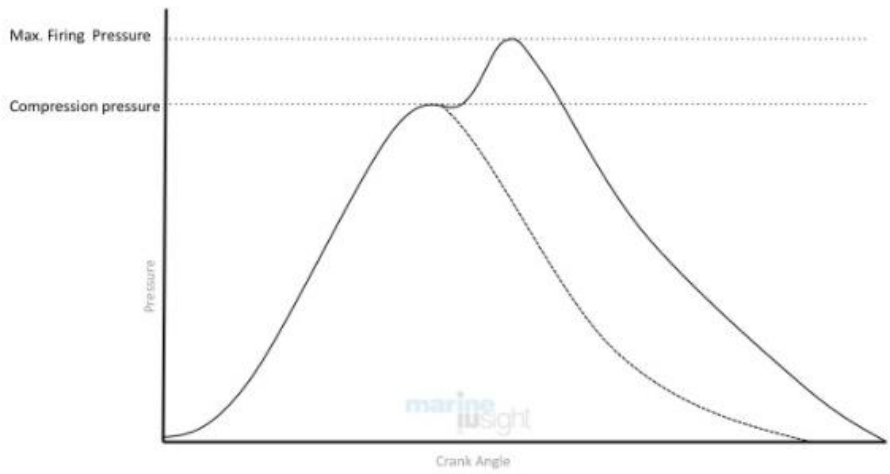

Figure 2: Metrics for the vessel's performance (Anish, 2021)

There are also many other procedures which belong to this category. Many studies have shown that Performance Management has driven to efficiency improvements up to 38 percent. Although may shipowners find that following a similar system is very costly for their companies. Owners and Operators who are open to new technology opportunities can deliver the most and it is concluded that the vessels are fitted with many systems, which monitor the equipment, and have a scope of improving their performance and reducing the corresponding costs. A recent study which was taken by DNV GL, tried to show how significant are the benefits resulting from the implementation of an effective Performance Management System. It was concluded that there are both environmental benefits and financial savings of 25 million dollars for the container fleets, as explained in the below diagram:

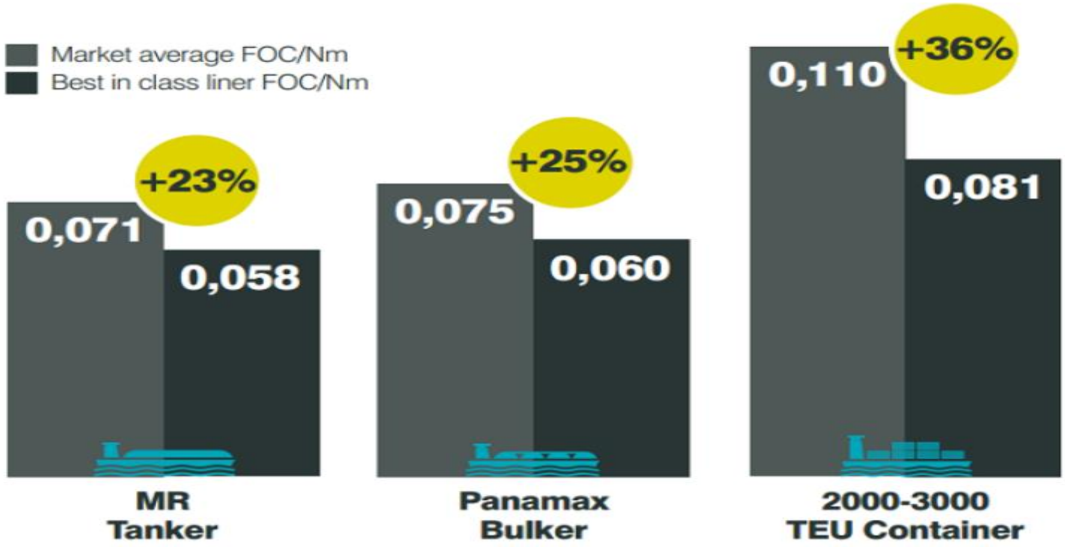

Figure 3: Study taken by DNV GL (DNV GL, 2020)

Performance Management systems should enable shipowners to identify trends and significant gains can be obtained if the complexities met are handled effectively and under coordination. There are many advantages of the adoption of this system, only if the shipowners and operators have understood all the required aspects. These aspects include: the objectives, the current situation of the company, the characteristics of the fleet, the method of collecting the data, the hardware systems used to collect data, the insight of the company, the behavioural changes and the actions of the management. A typical performance system must be characterized by the aspects that have been referred previously, but also must include the below standardized steps, in order to be direct and effective:

- Target and Goal setting: Targeting of goals is of high importance for a shipping company. These goals must be realistic and achievable. All the personnel must be aware of the corporate strategy and the assigned goals as well as of the steps which are scheduled to take place in a short term period. Only if the employees have acknowledged and incorporated the company's objectives will have motivation to contribute to the company's strategy implementation
- Rewards and performance linking: Shipping companies must combine the systems of performance appraisals and rewards provision. If performance evaluation is held without a positive or negative impact, then the system is

weakened. Rewards must be offered at a continuous basis to high motivated employees.

- Discussion of appraisal: After the completion of the performance evaluation, a discussion of the appraisal procedure and its conclusions must be held between the employee and the management. After this discussion the employee will have comprehended more the hazards, the strategy and goals of the company. Furthermore, the employee will be assigned with new responsibilities and have the opportunity to discuss about the faults and his achievements during the appraisal period.

A performance management system, in order to be effective in the shipping industry must: ensure quality of the required data, be easily used by the crew, be compared against industry's average and monitor KPIs as a basis for motivating people to change behaviour.

1.5.3 GENERAL DEFINITION OF KPI

KPIs include setting targets and tracking progress against that performance that an organization has to attain. They are used, in a wide range, especially nowadays, in different sectors of economy to evaluate the performance of the company. Such sectors are sales, marketing, HR, support, and finance. Especially in the shipping industry, performance is mostly evaluated and estimated through KPIs. Some examples of the most significant and vital KPIs that are used in shipping industry are: Average length of time between failures, which gives clear benchmark for costs, and loss of time for ships out of commission for repairs, unit Costs, which provides us with information about labour and material costs per vessel in the fleet, Vessel utilization, which amounts of time the vessel is in use, can help us to identify if vessels are being underused or overused and failure response time, which provides information about the improvement of cost-effectiveness and reduction of the time that vessels are in repair.

1.5.4 KPIS IN THE SHIPPING SECTOR

There is a variety of KPIs that are used in many sectors of the economy daily to measure the performance and the results. In the shipping sector many KPIs are used to measure and track the process of the shipment (especially when we refer to the logistics process of the company) and monitor supply chain, warehouse and transportation data to estimate if the processes are working appropriately. There are three types of KPIs which are used mostly in Shipping (especially in logistics field). The first category is the procurement KPIs, which track costs, like the inventory cost, the arrival time, and reorder time. These KPIs are helpful for managing and tracking inventory in a warehouse, for example, and ensure that all of the shipments are completed in time, without disruptions of the scheduled shipment program. The second category includes the logistics indicators, which track the picking, tracking process, and the order accuracy per worker. The third category includes the transportation indicators which try to evaluate the freight picks ups and delivery times, freight costs, as well as cost from order to delivery placement. Other categories of KPIs that are used in the shipping industry are the voyage performance KPIs, which evaluate the fuel consumption, the speed profile, the weather conditions, the trim adherence, the energy efficiency and emissions. Furthermore, there is the category of KPIs which evaluate the engine and systems performance.

1.5.5 KPIS & TMSA

In the context of TMSA, KPIs are used so as the company to evaluate the performance. Practically, performance evaluation is conducted from level 1 to level 4 for each of the 13 elements. Not all of the KPIs that are used in shipping sector can be used in TMSA, as this assessment is designed for companies which manage tankers or barges. If a KPI is considered as not applicable to the TMSA process, then the company must justify why this is not included in the process. Once the assessment is completed, then the company will have a clear summary of performance assessment. If the results are not satisfactory, then the company to identify gaps and may probably recommend new plans to improve the performance and meet other criteria that have not met during the previous assessment.

1.6.1 HOW TMSA WORKS

Each of the 13 components of which the TMSA consists of, includes some KPIs which are classified from level 1 (the lowest level) to level 4 (the highest level). Companies should match the SMS based on KPIs and the higher the level of each item, the more the company accomplishes the purpose for which the specific TMSA item has been established and fulfils the desired performance. At the same time, each section includes the Best Practice Guidance section, which describes the best practices for achieving the required level to which the specific section of the TMSA relates. If the TMSA elements are not fulfilled, then this will be an occasion for the company to propose new improvements and changes in order to increase its performance as much as possible. The 13 components of the TMSA are:

1) Leadership and the SMS

2) Recruitment and Management of shore-based personnel

3) Recruitment, Management, and wellbeing of vessel personnel

4) Vessel Maintenance, including critical equipment

5) Navigational safety

6) Cargo, Ballast, Tank Cleaning, Bunkering, Mooring and Anchoring Operations

7) Management of Change

8) Incident reporting, investigation, and analysis

9) Safety Management

10) Environmental and Energy management

11) Emergency preparedness and contingency planning

12) Measurement, Analysis, and Improvement

13) Maritime Security

From the above data of TMSA, it is concluded that specific data concern the management of human capital, such as elements 2 & 3. Therefore, human resources and the way they are treated are crucial for assessing the performance and risk of the organization. ExxonMobil’s International Marine Transportation's statement on the importance of TMSA is typical, as it states that the use of TMSA has greatly contributed to the reduction of accidents in recent years. At the same time, the company plans to introduce a new element that concerns the human factor. Specifically, a team of specialist psychologists will work with a corresponding team of experts in order to achieve the highest possible return and reduce risk.

1.6.2 VERIFICATION PROCESS AND SUBMITTING OF REPORTS

The TMSA results may be submitted to verification review by external assessors. Most of the times, the agreement for the verification of the assessment, is confidential between the company conducting the assessment and the external assessors. Company may use the results of the assessment, in case that the performance is estimated in high level, to demonstrate that the elements of TMSA have been met according to KPIs. When the assessment is completed, then the company must submit the report with the results to the TMSA online tool, choosing by this way who will be able to have access and read the report. No other companies have the ability to access this report and publish information resulting from the submitted report.

1.7. DESCRIPTION OF TMSA ELEMENTS

1.7.1 ELEMENT 1 & 1A - LEADERSHIP AND THE SAFETY MANAGEMENT SYSTEM

This element describes accurately the responsibilities that all the level of management have in a company, ensuring that all the tasks and jobs are clearly described, understood, and fairly assigned to all the employees. It is also required an effective communication system to be established between the employees working on shore and the company's fleet. The way that the SMS works must be communicated and understood by all the members of the company. The importance of HSSE, which has been previously analysed, will be promoted through leadership and the appropriate use of and effective SMS. All managers, at all levels and departments of the company are held responsible for the implementation of the SMS both ta sea and at the office. Element 1 is consisted of the below sections:

Element	Section	KPIs	Best Practice Guidance
1.1	1.1.1	Documented procedures define the management commitment	Mission statements contain goals (like zero accidents, environmental protection, reduction in emissions), long term aspirations. HSSE excellence is defined, continual improvement is achieved
	1.1.2	Senior management demonstrates commitment to implement SMS	Senior management conducts reviews
	1.1.3	HSSE excellence is implement by the onshore and vessel's personnel	Management must communicate all the requested information to the company

1.2	1.2.1	HSEE excellence must be described by all the personnel	All the members of the company what HSEE excellence means and how it is related with their role. Example of HSSE communication are: continuous training, vessel/office visits, seminars, meetings, and interviews
	1.2.2	Management should improve safety and environmental performance	Management has a plan to complete long term goals regarding safety and environmental performance, Management measures the performance through statistical records of incidents, such as injuries to personnel, oil spills, mooring incidents, incidents related to cargo and ballast transfer etc.
	1.2.3	Management promotes HSSE excellence	Strong leadership is demonstrated. Examples of HSEE promoting are: leading by example, safety inspections, ship visit by senior managers, Recognition and rewarding of HSSE performance

1.3	1.3.1	Targets should be established according to HSSE performance	KPIs that are used: Number of injuries, number of inspections, numbers of incidents etc.
	1.3.2	The steps required to reach HSSE excellence are defined by management	There is a plan which explains the steps for the fulfilment of goals for different periods of time
1.4	1.4.1	HSSE targets should be discussed at least quarterly	If performance is below the expectations, then management must realign performance with targets.
	1.4.2	HSSE excellence is controlled according to KPIs	Performance is monitored through new systems.
	1.4.3	Commitment to HSSE excellence should be demonstrated	Examples of commitment to HSSE excellence: reward systems, like bonus salary etc., a behaviour-based safety system.
	1.4.4	Continual improvements in HSSE performance should be included	The plan identifies: aims & objectives, strengths, weakness, opportunities, and progress against the plan

The primary aim of section 1A is to accept responsibility for developing and maintaining a dynamic SMS to implement policy and deliver HSSE excellence.

1A.1	1A.1.1	Management tries to ensure that all the activities are undertaken according to company’s policies and procedures	The policy reflects the company’s position on: safety protection, security, health and welfare and social responsibility
	1A.1.2	Policies and procedures should ensure effectiveness	Policy and procedures are revied and amended if necessary, receiving feedback from management or onboard safety meetings
	1A.1.3	Procedures should be written in common language	Procedures and policies are clear and are in the working language of the vessel.

			Additionally, policies and procedures must be explained in a logical manner
	1A.1.4	Procedures are accessible to personnel	Procedures should be accessible in written form by all the personnel
	1A.1.5	A SMS documentation is available, through a formal document control system	There is a procedure of revision of the SMS. The formal document control system includes: an index of numbered revision etc
1A.2	1A.2.1	Meetings that review these procedures take place	Keeping records of the meeting, its minutes and details about the changes that have been made to the procedures, and any other required information. Such information is: Recommendation following incident inspection, results of risk assessments, new legislation, suggestions for continual improvement
	1A.2.2	SMS defines the managers' responsibilities	Ways of demonstrating that the responsibilities are defined: organizational charts, job descriptions and KPI targets assigned to individual roles.
	1A.2.3	Relevant documents as a supplementary to the SMS both onboard and ashore	Documents include regulatory publications and industry lines
1A.3	1A.3.1	Dialogue is required between the vessel and onshore personnel to improve the effectiveness of SMS	Feedback is encouraged from users, who are related with the SMS. This may be related with: industry alert bulletins, seminars, open reporting programmes, customer, and contractor feedback forms
	1A.3.2	Procedures are covering shore and vessel operations are developed	Personnel are involved in procedures to develop new guidelines
1A.4	1A.4.1	Benchmarking is used to suggest SMS improvements	Safety and environmental standards from other companies are benchmarked, to confirm if practices require improvements or not
	1A.4.2	New innovations are required to improve the delivery of SMS	More effective ways of delivering the SMS to personnel are: the clarification and simplification of the language, new graphics and more attractive presentations, effective us of Information Technology
	1A.4.3	Senior management must verify the effectiveness of SMS	The assurance programme for checking of the effectiveness of SMS should include: an independent auditing body, third party consultancy etc

1.7.2 ELEMENT 2 – RECRUITMENT AND MANAGEMENT OF SHORE – BASED PERSONNEL

The main objective of this element is to ensure that there is the appropriate and adequate personnel to implement the SMS and meet the future needs of the company. The implementation of SMS must be effective, decreasing the levels of the risk and enhancing the levels of safety. As Shore – Based Personnel is defined the total of all the employees who are involved in the management of the vessels and the shore-based offices. DPA, CSO superintendents, technical managers and human resources managers may also be included in the shore personnel. Element 2 defines the procedures which must be followed in the recruitment, selection and training of the shore-based personnel. This element also includes the calculation of retention rates and comparison of the actual rates with the targets that have been assigned by the management. Retention Rate determines the percentage retention of fleet and office personnel. According to INTERTANKO given formula, if the average number of employees working for a period of 12 months is increased, then the ratio is also increased. If the total number of employees leaving the company for whatever reason increases, then the ratio is decreased. The opposite for the ratio is occurred, when the number of retirements and under-performers employees is increased. Specifically, the element's included procedures try to:

- Verify that all of the employees meet the medical requirements, which are requested for their recruitment
- Set criteria for promotion and a system of appraisal
- Ensure that all the records for personnel's qualifications, experience and training are maintained
- Promote the idea of continuity, that personnel in key roles must be trained and equipped with all the requested skills, contributing with this method to the development of new executives dedicated to fulfil all the assigned tasks effectively

This element is consisted of the below sections:

Element	Section	KPIs	Best Practice Guidance
2.1	2.1.1	A pre- recruitment process must be defined to ensure that all the candidates have all the requested knowledge, skills to meet the criteria for the recruitment	The minimum criteria required for this role are identified by the management systems
	2.1.2	The company has a written recruitment process	The process includes: verifying qualification with the issuing authorities, verifying experience with former employers, identifying training needs, and screening of candidates profiles
	2.1.3	A familiarisation process is required for new employees	This process includes: business ethics, HSSE policies
	2.1.4	There is a documented written procedure for shore-based personnel	The scope of this process is determined by the personnel's responsibilities

	2.1.5	Records of qualifications, experience for all the personnel is maintained	
2.2	2.2.1	Performance assessment is conducted at least annually	Performance assessment may include: Annual target setting, performance review - discussion, and discussion for any matter occurs after the completion of the assessment
	2.2.2	Retention rates are calculated for a period of two years are calculated	The method for the calculation of the retention rates must be demonstrated and new trends will be identified
2.3	2.3.1	Technical skills are improved through training and seminars	Individual training plans are designed for each employee
	2.3.2	Shore-based personnel must meet the requirements to implement the SMS effectively	Significant changes like, changes in the legislation and unprecedent, huge loss of personnel, may be taken into consideration and contribute to the estimation of the required number of employees, without disrupting the completing the tasks
	2.3.3	Retention rates and the targets must be reviewed	A benchmarking analysis is conducted comparing the actual retention rates according to the targets. The company tries to maintain the retention rates in a high level, through giving new opportunities to the employees and promoting them to new roles
2.4	2.4.1	Continual development of personnel should be conducted	Development of employees will be completed through educational programmes, coaching, cross – functional training
	2.4.2	Positions onshore should be filled	Suitable candidates are identified through temporary shore-based assignments, feedback from superintendents, and reviews
	2.4.3	Interpersonal skill training is promoted by the company	This kind of training develops: presentation skills, cultural diversity, negotiation skills, and effective communication

1.7.3 ELEMENT 3 & 3A – RECRUITMENT MANAGEMENT AND WELLBEING OF VESSEL PERSONNEL

In the previous element all the procedures and standards were analysed relating to the management and wellbeing of shore-based personnel. Elements 3 & 3A include similar procedures for the selection, recruitment and wellbeing of the Vessel personnel. The procedures included in this element are designed to:

- Ensure that all the employees have received the appropriate training and have all the required skills and experience, according to their records, to complete their tasks

- Ensures that the employees' working hours are recorded and supervised by the management and rest hours included in the everyday working program of each employee
- Promote the retention of the personnel in the company
- Determine the common language used onboard and ensure that all the employees have the ability to communicate through this language
- Promote cultural awareness and teamwork

In case that all the responsibilities are outsourced to third parties, then TMSA will handle these as they were performed by the personnel.

The primary aim of the Element 3 is to ensure that qualified personnel is recruited and trained accordingly to provide their services onboard, dedicated to complete the company's objectives. This element is consisted of the below sections:

Element	Section	KPIs	Best Practice Guidance
3.1	3.1.1	Procedures for the recruitment, development and appraisal should be determined	The company has determined sufficient and detailed procedures for the responsibilities of the personnel.
	3.1.2	Medical certificates should be in place according to the flag in which the vessel is registered	a procedure that all of the certificates are approved by a medical practitioner, is in place
	3.1.3	Mandatory training needs are in place	Analysis of the training needs should be conducted
	3.1.4	Familiarization procedures are in place for vessel personnel	
	3.1.5	Handover procedures for key vessel personnel are provided	
3.2	3.2.1	Appraisal procedures are in place	The procedures may include: frequency of appraisals, the content of the appraisal
	3.2.2	Procedures provide additional training	Personnel career development requests are included in these procedures
	3.2.3	All the personnel's requirements are verified	Verification process may include checking of: experience, training, appraisal records and compliance with the legislation
	3.2.4	Procedures to identify training requirements for personnel are in place	New training needs are created if there is a change in legislation.
	3.2.5	There is a more complicated recruitment procedure for senior officers	The procedure must include an explanation of the company structure and philosophy.
	3.2.6	The company monitors training effectiveness and impact to the personnel	The effectiveness can be measured by review of vessel performance trends, and review of audit and inspections trends. The effectiveness is measured and monitored in a regular basis and

			improvement actions are suggested by the management
	3.2.7	There is a detailed written promotion procedure in place	
3.3	3.3.1	There are detailed and more complicated appraisal procedures for senior officers	Appraisal procedures must focus on: Leadership, personnel management, communication, shipboard operational performance, and the requested requirements
	3.3.2	The company focus on further career development of junior officers and promotion of senior officers to a more complicated and more demanding role	Career development guidance is provided to the personnel and the requirements for their promotion are analytically determined
	3.3.3	Training for the personnel should exceed the minimum requirements of International Convention on STCW	Additional training needs for the development of personnel are identified
	3.3.4	Personal selection and recruitment is reviewed to ensure the compliance with company's policies and procedures	Personnel departments are audited at their premised at least annually, according to ISM requirements.
3.4	3.4.1	Procedures to assess the crew competency for each position are in place	These procedures include: psychometric assessments and assessments based on specific criteria determined by the company
	3.4.2	A detailed written procedure is provided to ensure that manning needs are covered	This procedure includes ways to estimate the possible retirements and hiring of new employees.
	3.4.3	Multicultural and interpersonal skills are developed	Interpersonal skills are enhanced and developed by training which include:, communication styles, and new tools may be used to enhance these skills

Element 3A tries to ensure that safety, health, and wellbeing of the personnel is effectively managed. This element is consisted of the below sections:

Element	**Section**	**KPIs**	**Best Practice Guidance**
3A.1	3A.1.1	The vessel is adequately manned to ensure safe operation onboard	Manning levels should be adequate to satisfy vessel's needs for the
	3A.1.2	Resources to ensure the wellbeing of the vessel's personnel are provided	Management ensures that there are many resources to care for the vessel's personnel wellbeing. There are many aspects of wellbeing like quality of food, accommodation, facilities, the relaxing time, access to medical help etc.
	3A.1.3	Ensures that the working and resting hours are compatible with the STCW	Non-compliance with these requirements is identified and new improvement actions are suggested. In case that additional manning is required for a specific voyage.

	3A.1.4	D&A policy is monitored and implemented	The policy complies with OCIMF guidelines
3A.2	3A.2.1	Personnel's complaints should be provided through formal procedures	The process must comply with the flag, be acknowledged by the personnel at any time and the complaints must be handled in an effective manner and improvement actions to be suggested
	3A.2.2	A documented disciplinary procedure is in place	This procedure must be compliant with legislation and give clear guidance to the master
	3A.2.3	High standards of hygiene are satisfied	Procedures may include: taking responsibilities for ensuring hygiene standards in storages, decks and cabins, at the same time with the requested inspections by the relative authorities
	3A.2.4	Retention Rates for Senior Officers over a two-year period are calculated	The company calculates the retention rate according to a published method (has been previously analysed). Conclusions are drawn after the completion of the retention rate calculation
3A.3	3A.3.1	Seminars are held for senior officers promoting the principles and the significance of SMS implementation	The content of these seminars is related to new legislation, environmental management, company's culture and safety – human issues
	3A.3.2	An enhanced disciplinary procedure is in place	
	3A.3.3	Health awareness campaigns are implemented	These campaigns include: weight loss, healthy living, stop smoking, precautions related to extreme temperatures and humid climate
	3A.3.4	Retention rates for officers are calculated for a period over than two years	The company calculates the retention rate according to a published method (has been previously analysed). Conclusions are drawn after the completion of the retention rate calculation
3A.4	3A.4.1	Seminars take place for all the officers to enhance the idea and the significance of the SMS	The content of these seminars is related to new legislation, environmental management, company's culture and safety – human issues, as referred in section 3A.3.1.
	3A.4.2	A detailed procedure is in place to conduct health risk assessment	Risk assessments may include: exposure to various stressful conditions.
	3A.4.3	Career development opportunities are provided	

1.7.4 ELEMENT 4 & 4A – VESSEL RELIABILITY AND MAINTENANCE INCLUDING CRITICAL EQUIPMENT

The main aim of this element is to ensure that the vessels of the fleet have the capability to operate safely, efficiently without the possibility of disruption in the daily operation of the vessel. In addition, control measures are developed for critical equipment. Maintenance includes periodic inspection or inspection which are held in more regular basis. Unplanned maintenance may be also held due to an unusual condition or a breakdown. The reliability of the vessel is depended on design, construction and operating practices and programmed maintenance tactic which is followed by the management. The vessel is subject to a variety of risks due to its daily operation, which may be harmful for the personnel. For this reason, there are procedures which have been determined by the company to hedge and mitigate the risk. In detail, these procedures:

- Ensure that certifications remain valid
- Ensure the availability and sufficiency of the spare parts and other materials necessary to carry out the maintenance process
- Have a system in place to monitor overdue maintenance

This element is consisted of the below sections:

Element	Section	KPIs	Best Practice Guidance
4.1	4.1.1	Each vessel is covered by a planned maintenance system	All the equipment, machinery and sparts required for the maintenance must be included in the used system.
	4.1.2	A reporting system should also be provided to each vessel	The reporting system covers required onboard equipment and includes condition of Class.
	4.1.3	The status of fleet maintenance must be reviewed	The review includes: status of defects, the number and nature of any outstanding, the identification of any assistance required, such as spare parts or shore technicians. If the tasks cannot be completed, then there is the possibility to reorganize the program for maintenance
	4.1.4	The company monitors the planned maintenance procedure	The number of planned maintenance tasks, included in the maintenance process, are recorded both for vessels and the fleet. Data must be recorded monthly, and then be reviewed accordingly if a shore assistance is required
4.2	4.2.1	This procedure ensures that the stature and Classification certificates are valid	The procedure provides with: class status reports, planning for surveys, dispensation and exemptions
	4.2.2	Cargo and ballast spaces are inspected	The frequency of each inspection is determined by regulations of Class, Flag State and national authorities. Guidance for inspections may also be provided, which may include Class publications
	4.2.3	Maintenance is verified by Superintendents	Superintendents verify that the required maintenance has been completed, check the engineering practices and verify that all the defects have been recorded suitably
	4.2.4	The company has a system to develop dry-dock specification	The system include guidance for shore and vessel personnel on: suggestions and new regulatory requirements

4.3	4.3.1	A computer – based maintenance system onboard records all maintenance tasks	
	4.3.2	The company policy is to maintain an optimum spare parts inventory for all vessels	Sufficient spare parts are maintained onboard and ashore.
	4.3.3	Performance indicators have been used, which are measured for each vessel and for the fleet in total to measure the fleet reliability	Some examples of what these indicators include are: breakdowns related to critical equipment, loss of manoeuvrability occurrences, blackout occurrences, unplanned maintenance as a percentage of total maintenance.
	4.3.4	The frequency and the level of high level inspections are determined	
4.4	4.4.1	The maintenance reporting system integrates the spare parts inventory management	The system: automatically updates the inventory for usage and replenishment,
	4.4.2	The maintenance and defect reporting system tracks all deferred repair items for inclusion in the dry-dock specification	This system may be integrated with other system to generate the required specifications
	4.4.3	The maintenance and defect reporting systems provide management with a real time status of fleet maintenance	Reports for vessels and for the fleet may include: defects, requisitions and inventory status
	4.4.4	The planned maintenance system tries to ensure best equipment performance	Records are available to demonstrate: performance monitoring, remote diagnostics. The results of system's monitoring are evaluated
	4.4.5	Engineering audits are completed by a suitable representative	The purpose of the audit is to: review and confirm that practices are in compliance with industry standards.

The main objective of element 4A is to manage the maintenance of critical equipment and systems. This element is consisted of the below sections:

Element	**Section**	**KPIs**	**Best Practice Guidance**
4A.1	4A.1.1	Equipment and systems are identified according to SMS and the planned maintenance system	Possible operational failure which will contribute to the harm of the vessel, or the personnel is identified.
	4A.1.2	The maintenance of equipment and systems is determined by various procedures	In case that the planned maintenance is not completed, risk assessment must be conducted
	4A.1.3	A procedure is determined which informs shore management when a problem or failure is noticed for the critical equipment and then the	

		management must schedule an unplanned maintenance	
	4A.1.4	Procedures are included which conduct the testing of equipment	Testing is performed according to mandatory requirements
4A.2	4A.2.1	Maintenance on critical equipment and systems which take them out of service, must be submitted to risk assessment	Apart from the risks related to the tasks, the risk assessment must also focus on the hazards provoked by taking the equipment out of service.
	4A.2.2	Work instructions are available in the planned maintenance system for critical equipment and systems	Planned maintenance is always carried out according to the work instructions
4A.3	4A.3.1	Maintenance of critical equipment must be conducted by specified personnel	The personnel responsible for the maintenance of the vessel must have all the appropriate knowledge, skills and requirements to fulfil this task
	4A.3.2	A procedure records all the performance data for all critical equipment and systems	Equipment Healthy is estimated through comparison between performance date and manufacturer's test
	4A.4.1	The reliability of critical equipment re maintenance system is monitored in continuous basis	The company tries to improve the maintenance system by forecasting the necessary improvements of critical systems

1.7.5 ELEMENT 5 – NAVIGATIONAL SAFETY

The primary aim of this element is to ensure that company's vessels operate and are navigated safely at a daily basis. Shore-based management must ensure that: the SMS includes navigational procedures that cover each stage of vessel's voyage, there is the sufficient personnel responsible for maintaining the navigational standards on shore, the management team of the vessel is appropriately trained, vessel's equipment is well maintained. Navigational standards are appropriate for the safety of vessels. This element is consisted of the below sections:

Element	Section	KPIs	Best Practice Guidance
5.1	5.1.1	Appropriate personnel is designated for navigational standards	The responsible persons must be qualified, experienced and have the authority to ensure navigational standards
	5.1.2	Many procedures that ensure the safe navigation have been determined	These procedures include actions upon equipment failure, supporting checklists, berth to berth passage planning and actions upon meeting rainy weather, low visibility and ice
	5.1.3	Procedures to ensure effective resource management are in place	These procedures include handovers, navigation with pilot aboard etc.
	5.1.4	Procedures to ensure that navigational equipment is	Procedures include: defecting reporting, provision of spares as appropriate.

		maintained appropriately are in place	
5.2	5.2.1	The Master conducts a navigational audit to ensure that navigational procedures and regulations are met	The company provides an audit format and sets the frequency for completion. The frequency of the audit varies and depends on the voyage duration. However, the frequency must not exceed 12 months
	5.2.2	Navigational assessments are undertaken according to detailed procedures	Master's navigational audit is verified and updated according to new legislations and updates.
	5.2.3	Navigation procedures are checked that have been updated recently	The procedures must be updated according to new requirements and legislation
	5.2.4	A procedure is included to identify deficits in navigational equipment	
5.3	5.3.1	Charts and licences are provided by a recognised chart agent	
	5.3.2	Appropriate training is received by Senior Officers before their promotion	Ship handling experience is obtained through training and through a competency development system designed by the company
	5.3.3	Navigational Audits are conducted by an experienced executive	All the vessels must be audited at a period that does not exceed the two years
5.4	5.4.1	Navigational Audits are conducted by an experienced executive	The audit process may be similar to the process followed on 5.3.3
	5.4.2	Audit Reports are analysed, and conclusions are drawn	Reports analysis tries to identify problems and weaknesses in navigational procedures
	5.4.3	Masters and navigation officers should maintain the appropriate skills according to the assessment programmes	The assessment may include: knowledge, response to special and emergency situations
	5.4.4	Simulator training is conducted by navigation officers	

1.7.6 ELEMENT 6 & 6A – CARGO, BALLAST, TANK CLEANING, BUNKERING, MOORING AND ANCHORING OPERATIONS

The main aim of this element is to establish planning and operational procedures to ensure that the above operations are conducted effectively and safely. The standards of execution of these operations are highly significant and their importance for the vessels and personnel's safety and protection of the environment is huge. Therefore, shore-based management must ensure the below:

- Procedure cover cargo requirements and tests and checks are conducted

- All cargo and ballast tank cleaning is scheduled to be executed efficiently and quickly
- Compliance with procedures is assured by an audit plan
- Procedures cover all of the required mooring and anchoring activities
- Vessel personnel receive familiarisation, training and mentoring

This element is consisted of the below sections:

Element	Section	KPIs	Best Practice Guidance
6.1	6.1.1	Procedures for cargo, ballast, tank clearing, and bunkering operations are in place for all the vessels	These procedures include role and responsibilities, planning, cargo and ballast handling, maintaining tank atmospheres, bunkering and record keeping
	6.1.2	For all vessel types, procedures have been determined for the check of cargo and bunkering equipment	Tests and checks of equipment may include: ESD system operation, cargo line pressure testing, loading computer and alternative calculations, cargo and ballast pump tests and gas monitoring equipment
	6.1.3	Management verifies that the above procedures are conducted appropriately	Verification is conducted through analysis of third-party inspections, remote sampling of records by shore management and terminal feedback
	6.1.4	The company has procedures that address cargo specific hazards for all vessels types within the fleet	Cargoes with specific hazards may be disastrous for the environment and sea provoking, toxic pollution, aromatic hydrocarbons and high vapour pressure cargoes
6.2	6.2.1	The procedures must be in place as referred in section 6.1.1	These procedures include the same characteristics as the section 6.1.1, with more complicated some procedures which are referred in this section
	6.2.2	All types of vessels and cargo transferred must be specified according to the established procedures	The transfer procedures are determined according to the cargo and vessel type
	6.2.3	Ballast Handling procedures are established	Many procedures like ballast, deballasting operations, ballast water exchange etc. are included
	6.2.4	Tank cleaning operations are explained in detailed procedures	Cargo grade change, dry dock preparation, tank inspection and repair are some reasons which contribute to tank cleaning
	6.2.5	Procedures are established for bunkering operations	These procedures include: terminal pipeline, bunker barge alongside, LNG bunkering, packaged lubricants.
6.3	6.3.1	Templates are used for keeping records	Templates are developed for different operations like, cargo, ballast, and bunker operations
	6.3.2	Tank atmospheres required levels are maintained according to the procedures established in this section	There are two categories for vessel: vessels fitted with an IGS, and these which are not fitted with IGS.
	6.3.3	Procedures for the transfer of unusual cargo and the corresponding operations are established	These operations may include: STS operations, inhibited cargoes and cargo dosing etc.

	6.3.4	The involvement of Junior Officers is presented in this section, in procedures that are related with tank cleaning, bunkering and other vessel's operations	An effective management system for these operations is established for Junior Officers
6.4	6.4.1	Courses which provide training in response to special and emergency situations are provided to the officers	These courses are used to train junior & senior officers. In addition, they try to familiarize the personnel with the new equipment and systems
	6.4.2	Audits are completed by an experienced company's representative, who observes all the above vessel operations	All vessels are audited once per year and after the completion of the process a report is written to recommend improvement actions

The element 6A is called Mooring and Anchoring Operations and its primary aim is to establish planning and operational procedures for mooring and anchoring operations. Procedures ensure that the vessel remains safely moored and the safety of the personnel involved in mooring and anchoring operations.

Element	**Section**	**KPIs**	**Best Practice Guidance**
6A.1	6A.1.1	Mooring and anchoring operations are determined according to detailed procedures	In these procedures guidance is included which ensures the protection of personnel and safe operation of equipment
	6A.1.2	Maintenance of mooring and anchoring equipment is provided	The planned maintenance system must cover all mooring equipment
	6A.1.3	The company has procedures to manage the condition of mooring ropes, wires and mooring tails	Instructions about the handling of the equipment is included in these procedures
	6A.1.4	Procedures are included for the use of tugs	The safe handling of ships' lines or tug lines is satisfied by these procedures
6A.2	6A.2.1	All the types of mooring operations are implemented	Procedures have been developed for all the mooring operations
	6A.2.2	Procedures address different types of anchoring operations	
	6A.2.3	Vessels remain safely moored at each stage	Procedures are included which ensure: sufficient personnel are retained onboard to tend moorings, passing traffic is monitored, changes to environmental conditions are monitored.
	6A.2.4	Replacement of wires ropes and tails takes place	Inspection methods which ensure the maintenance requirements, the minimum number of spares that are required for vessel's operations, are determined in this section
6A.3	6A.3.1	Appropriate requirements are identified for personnel involved in mooring	Such requirements are: designated person in charge at each location, minimum numbers of personnel required at each location

	6A.3.2	Measures should be taken to ensure the safety of vessel personnel, involved in mooring operations	Hazards, deficits and failures in the mooring equipment are identified
	6A.3.3	The use of ancillary craft is promoted	These procedures include: harbour tugs, line handling boats, escort tugs
	6A.3.4	Mooring equipment should comply with the latest provisions and legislations	The process includes: new build design review and amendments, during construction and modification
6A.4	6A.4.1	Mooring equipment manufacturing, like ropes and wires, is searched	Manufacturers' involvement includes: guidance on equipment specification, selection, and replacement, training of personnel
	6A.4.2	Procedures should ensure that the vessel may safely moor to the terminal, where the vessel moors for the first time. A range of means are used for this purpose	The means include: available information from port agents and port authorities, past records, company information for previous fleet visits
	6A.4.3	Audits are completed by experienced executives.	All fleet vessels are audited annually
	6A.4.4	Safe mooring operations are achieved through the technology innovations	Design improvements are promoted and suggested according to the new build specifications, an upgraded as required.

1.7.7 ELEMENT 7 – MANAGEMENT OF CHANGE

The main objective of this element is to ensure that all the relevant risks are identified properly. The company has established a formal process to evaluate and process permanent changes that could impact their operations. Changes to equipment, suppliers, personnel or major changes in the fleet's size can fully increase the risk of an incident. Management of change must ensure that:

- New training requirements are identified
- Relevant documentation is amended following changes which are identified by this element
- There is an appropriate procedure for onshore – onboard personnel's familiarisation,
- Results of changes are reviewed to that all the objectives are satisfied

This element is consisted of the below sections:

Element	Section	KPIs	Best Practice Guidance
7.1	7.1.1	Procedures for management of change are in place	They are related to permanent and temporary changes
	7.1.2	The impact of any change is estimated according to specific procedures	The assessment includes the following factors: justification for change, risk reduction measures and any additional resources required

	7.1.3	The level of authorities that have the right of approval are determined by these procedures	Any change is approved by a specific person or by the person related to the change
	7.1.4	Emerging requirements are identified by these procedures	These requirements are probably imposed by the law and may be permanent or temporary
7.2	7.2.1	All the changes should be effective according to the management of change	Risk assessment identifies all kinds of hazards
	7.2.2	Management of change tries to identify if the personnel is affected	The management of changes tries to ensure that personnel is involved in the appropriate programs and their implementation for their development
	7.2.3	Management of Change ensures that training needs are identified and documented	Personnel may be affected by changes in the training and familiarization needs
	7.2.4	All documentation and records that are affected by the changes are identified	The permanent changes resulting from the management of change are identified and documented
	7.2.5	Management of change is conducted at a regular basis	The plans are documented to facilitate the review of the process
7.3	7.3.1	New procedures should be established when new vessels are purchased	The procedures here are implemented to existing vessels and new acquirements
	7.3.2	This section is a detailed review that all changes have been implemented	The company reviews the changes implemented to verify that objectives have been completed. The findings may be included in the periodic reviews
	7.3.3	There is a software system to cover both onboard and shore needs	The procedures resulting from this system include: performance tests following software upgrades and training requirements
7.4	7.4.1	If there are major changes in the shore's personnel, then these procedures must ensure that manning and executives skills and experience are maintained	Major changes may be: major changes in the fleet's size, introduction of new vessels types in the market or significant changes for the restructuring and reorganisation of the company
	7.4.2	Improvements for new designs are suggested	Existing vessels are upgraded with the new designs, and these are taken into consideration for the future designs.

1.7.8 ELEMENT 8 – INCIDENT REPORTING, INVESTIGATION AND ANALYSIS

This element is used in TMSA for the appropriate establishment of procedures that ensure the effective reporting, investigation of incidents to prevent them. According to this element, all incidents and extraordinary cases can be handled as soon as possible. Another significant aim of this element is to ensure that the incidents have been communicated in time to all the personnel and reoccurrence of these incidents is provoked. With this way, creation of new problems is significantly decreased, and the risk is not too high. Especially, these procedures:

- Provide reporting and further investigation for the reasons have provoked an incident and the consequences of them
- Authorize the appropriate personnel who will be responsible for the identification of the incidents and for the further reporting
- Provide additional training to the personnel who have the responsibility for the incident reporting
- Ensure that the reasons provoking the incidents have been identified and analysed to avoid similar situations in the future
- Include procedures to determine the actions required to reduce the risk of incidents
- Ensure that new improvements in the methods used in the SMS are recommended
- Include directions on the classification of all incidents

Element 8 is primarily used for the investigation and analysis of methods to learn from the incidents and their consequences. This element is consisted of the below sections:

Element	**Section**	**KPIs**	**Best Practice Guidance**
8.1	8.1.1	Investigation of incidents and reporting are suggested according to established procedures	These include: definition of incidents, definition of personnel responsible for the analysis of the incidents
	8.1.2	The investigation procedures ensure that required notification are carried out	Examples of mandatory reports are the reports which include notifications to: DPA – CSO, Flag State, Classification Society
	8.1.3	The fleet is notified of urgent information	An incident occurred and the company was identified
	8.1.4	Incidents are investigated and improvement actions are suggested	The basic causes of the incident are determined
	8.1.5	Personnel receive the appropriate training to identify the incidents properly	New training programs are recognised, appropriate training by a trainer is conducted and there is also computer-based training
8.2	8.2.1	The main causes of an incident are determined by the investigation procedure	This procedure includes a well-designed methodology to determine root causes

	8.2.2	The structure of the investigation team is determined according to the type of the incident	The personnel who are selected as members of the investigation team should not be related with the incidents
	8.2.3	Investigation training should be provided to at least one member of shore based management	Courses regarding incident and investigation analysis is provided to the personnel
	8.2.4	The safety culture encourages reporting for all incidents	The reporting system is user friendly and encourages full participation from vessel personnel
	8.2.5	Determining the causes of an incident prevent for any recurrence	A process is provided which tries to analyse root causes of incidents and draw conclusions
8.3	8.3.1	After drawing conclusions from incidents, safety performance statistics are promulgated	Analysis from the statistics is used to drive improvements in HSSE performance
	8.3.2	Analysis of incidents is conducted at periodic intervals	New trends are identified by this analysis. Furthermore, the effectiveness of the measures and new improvements are examined
	8.3.3	Incidents are reported directly to vetting departments	OCIMF may also have access and use the data
	8.3.4	Incident investigation takes place after an appropriate period	The appropriate period is defined by the company
8.4	8.4.1	Incident analysis is shared with industry groups	Such groups are classification societies, peer group associations and manufacturers
	8.4.2	Trained personnel have the opportunity to participate in incident investigation analysis, according to predetermined procedures	Trained personnel have the opportunity to participate in incident analysis, according to their skills, experience and knowledge

1.7.9 ELEMENT 9 & 9A – SAFETY MANAGEMENT

This element develops a safety culture both for board and ashore operations, that includes identification and mitigation of risks. It is also required that these procedures will promote the effectiveness of safety management systems and motivate the personnel to understand its significance.

This element is consisted of the below sections:

Element	Section	KPIs	Best Practice Guidance
9.1	9.1.1	Safety standards are monitored by shore based management executives	A safety element is ensured that is included by conducting the inspections
	9.1.2	Promoting of strong safety culture is promoted across the fleet	Meetings regarding safety issues with vessel’s personnel are conducted. The results of these meetings are conducted during sore management visits to vessels

	9.1.3	Procedures include a detailed risk assessment system	Hazards in both onshore and ashore operations are recognized by the risk assessment systems
	9.1.4	A documented permit to work system is in place	The permit is used to control, restrict all the hazards resulting from ashore and onshore activities
9.2	9.2.1	Safe working procedures are developed by risk assessments for routine tasks	Risk mitigation measures identify potential hazards
	9.2.2	The risk assessment system should recognize and identify new tasks, planned or unplanned	The risk assessment process results in alternative methods of work being considered and documented where the risk is identified
	9.2.3	Risk assessment systems for new and unplanned tasks are accessible by all the personnel	These risk assessment systems are used by shore based personnel. In addition, all the personnel should be familiarized with the content and way that these systems work
	9.2.4	All mitigation measures should be implemented prior to commencing work	Such procedures include permit to work and extensive use of the risk assessment system
	9.2.5	Safety onboard is conducted by procedures	These procedures include: define and identify onboard contractors, establishment of responsibilities
9.3	9.3.1	There is a process designated to review the risk assessments	The review process ensures that all risk assessments have a relationship with the impact of new legislation, the changes in manning levels and non-routing tasks
	9.3.2	Safety tools are used to ensure safety awareness through the organisation	These tools include: unsafe awareness programmes, behaviour-based safety systems and new courses – campaigns which promote the strong safety culture among the company
	9.3.3	A list of approved contractors maintained by the company	These procedures work as a guideline for the selection of contractors and in case that the contractors are not included on the approved list, then corresponding actions must be taken
9.4	9.4.1	The improvement of safety culture is completed by management and the use of risk management systems	Common areas of risk management are identified among the company and are shared across the organization
	9.4.2	Safety publications must be issued at a periodic frequency, for example quarterly	Publications which analyse past case of incidents are shared across the personnel and analyse the main causes of these incidents
	9.4.3	HSSE management system is used	Procedures for contractor management are established, which include: creating appropriate KPIs to evaluate further the performance, role assignment to the contractors and creating the appropriate KPIs to evaluate further the performance.

The main role of element 9A is to establish an active safety culture onboard through the introduction of hazard identification incentives, risk management systems and reporting programmes. This element is consisted of the below sections:

Element	Section	KPIs	Best Practice Guidance
9A.1	9A.1.1	Safety inspections are conducted by a designated Officer, according to the procedures	Safety inspections of the vessel: identify hazards and the consequences to the safety, health of personnel and environment, are recorded and reviewed at a constant basis. Procedures provide details about the frequency and format of the inspections.
	9A.1.2	Hazards should be acknowledged, identified and be reported	When hazards are identified, the managements is informed and takes all the necessary actions
	9A.1.3	Safety meetings are held onboard at least monthly. In case that an emergent issue has been raised, then extraordinary meetings will be held and problem or the new situation will be handled and solved	In this kind of meetings all the personnel have the right to participate and have an interactive – active discussion analysing different issues regarding safety awareness, voice safety concerns and corrective actions
	9A.1.4	Work planning meetings should be held, to ensure consistency with organization's goals	In these meetings operational or departmental conflict, required equipment and personnel requirements are identified and compliance with work and rest hours is ensured
9A.2	9A.2.1	The prevention of unsafe and risky actions is promoted through determined procedures	Safety intervention techniques are used, and the progress is reviewed at the monthly safety meetings
	9A.2.2	Training regarding training and hazard identification is offered to the personnel	The kind of training which is provided is based on the responsibilities, experiences and the roles of the personnel
9A.3	9A.3.1	The reporting of safety practices is promoted	Safety best practices are reviewed to the fleet and if there are deemed as appropriate then they are incorporated into the revised procedures
	9A.3.2	The impact of safety across the organization and especially the vessels is estimated and possible improvements are suggested	Procedures measure: incident free days, safety regulations, identified hazards, behaviour-based safety system observations and safety suggestions. The results are communicated to all the personnel
	9A.3.3	Opportunities are identified by the management to ensure that the current levels of safety are satisfied.	Methods of interaction between the personnel are: seminars, webinars, safety magazines, or company produced videos
9A.4	9A.4.1	Indicators of safety performance are analysed on a vessel or the fleet totally. With this analysis areas which lack of the required safety culture are identified and improvements are suggested	The analysis is used to identify weaknesses, to generate safety campaigns and the level of safety performance is fed back to the management review.
	9A.4.2	Safety culture is promoted by safety trainers during the training sessions	The main responsibilities of the safety trainer is to assess the level of safety culture onboard, reinforce the company's

			safety initiatives and provide training as requested. After the completion of the procedure, the trainer prepares a report and the company reviews and analyses this report to identify areas for improvement

1.7.10 ELEMENT 10 – ENVIRONMENTAL AND ENERGY MANAGEMENT

The main objective of this element is to establish procedures that promote the balanced environmental and energy management and include identification of sources of environmental emissions. In addition, new measures are suggested to avoid the impacts to the environment. Companies establish the right procedures to reduce the negative impact to the environment. These procedures include:

- Development of environmental protection policy
- The identification and assessment of environmental emissions
- Effective fuel management
- Optimising energy efficiency
- Establishing requirements for ballast water exchange
- Internal and external benchmarking of environmental performance

This element is consisted of the below sections:

Element	Section	KPIs	Best Practice Guidance
10.1	10.1.1	An environmental protection policy and management system is in place	This policy is undertaken by senior management and tries to minimize the environmental impact of the operations.
	10.1.2	All sources of environmental emissions have been systematically identified	A variety of emissions are included such as: funnel emissions, greenhouse gases, cargo residues, garbage, oil emissions, ballast water, sewage and antifouling paints
	10.1.3	Emissions are decreased to the lowest level that is permitted according to the established procedures	Procedures include: methods of minimizing emissions, identification of applicable regulations, emissions monitoring, and fuel analysis
10.2	10.2.1	Energy efficiency and fuel management are also significant for the environmental management	Energy management may include monitoring for the following: daily fuel consumption including main engine, boilers, vessel’s speed and distance travelled, vessel’s condition and weather or climate changes.
	10.2.2	Through the environmental management plan measures are suggested to improve environmental performance	These actions include many measures for example: establishing baseline criteria and targets to be achieved,

	10.2.3	Energy efficiency should by optimised by these procedures and measures	Measures include: optimisation of vessel trim, speed optimisation, weather routeing, optimising onboard power management such as the use of generators and boilers, propeller and hull cleaning
	10.2.4	Energy efficiency and reduced emissions are achieved by the environmental management plan	These procedures try to ensure quality control of fuel
10.3	10.3.1	The environmental impact of organization's activities is subject to appraisal	This appraisal includes: measurement of all emissions, acceptable impact levels, and impact upon marine life. There are also procedures which include mitigating measures to minimize the environmental impact
	10.3.2	Emissions reduction targets are set in the environmental management plan	Targets may be set for: Greenhouse gases, garbage, oil emissions etc
	10.3.3	Environmental plan is created in a long-time basis	Long-term objectives, short-term targets are included in the environmental plan
	10.3.4	Environmentally ship recycling practices are used	
	10.3.5	Improvements that are environmentally friendly are incorporated in the new ship building designs	This may include: clean fuel technology and waste reduction equipment
10.4	10.4.1	Energy efficiency is maximized by available technology	This may include: emerging coating technologies, alternative energy efficient fuels
	10.4.2	New ideas are explored, investigated and suggested regarding the environmental performance. Some of these ideas are incorporated to the vessel's design	Examples may include new propulsion concepts and new – innovative ideas for engineering
	10.4.3	Benchmarking analysis is conducted for environmental performance and energy efficiency	Measurement and benchmarking of the performance is undertaken

1.7.11 ELEMENT 11 – EMERGENCY PREPAREDNESS AND CONTINGENCY PLANNING

The main aim of this element is to establish a detailed emergency system and the management to ensure that this system has the ability to manage incidents.

This element is consisted of the below sections:

Element	Section	KPIs	Best Practice Guidance
11.1	11.1.1	Vessel emergency response plans must cover all emergency scenarios and	Vessel emergency response plans must be up to date. For this reason, they are updated at least once per year, to incorporate all the changes in the

		include notification procedures	company's procedures, changes in the legislation and the equipment.
	11.1.2	A shore-based emergency should cover all the possible emergency scenarios	The shore plan includes effective notification procedures and internal systems to promote the effective communication
	11.1.3	According to the shore-based emergency response plan and the relevant procedures, responsibilities and roles have been assigned to the appropriate personnel	Personnel are trained in their emergency special roles, according to the responsibilities that are assigned by the plan
11.2	11.2.1	The company provides suitable emergency response facilities	This includes a dedicated room with facilities such as: phone lines, sufficient computer work stations, electronic or paper charts, satellite and breakout rooms.
	11.2.2	The number and type of vessels determine the scope and frequency of drills	Exercises should be completed within the time frame
	11.2.3	Procedures are also included which analyse the significance of interaction with the media	Personnel receive the appropriate media training corresponding to their assigned role. Outsourcing for these trainings may be assigned to external companies
	11.2.4	The conclusions that have been drawn from the incident analysis and reports, are included in the emergency response plans	Issues and potential improvements are identified and suggested, and exercises of incidents are discussed at the management levels
11.3	11.3.1	The record of participants' data who have been involved in emergency drills and exercises should be kept	Despite the members of the company, external resources may also participate to in exercises and drills
	11.3.2	Procedures are ready to be used, in order external resources to participate in an emergency case	Contact details must be available at any time for all the relevant personnel like: salvage – towage contractors, emergency response services, flag states, legal resources, agents etc.
	11.3.3	Drills and exercises test the effectiveness of procedures in order external resources to participate in an emergency case	External resources are mobilised at least annually.
	11.3.4	Business continuity has been processed	Detailed documentation is kept by the company so as to ensure that safe management of the fleet is maintained
	11.3.5	Procedures address recovery following an incident	Procedures include: assessment of the vessel's and personnel's ability to procced on voyage, the need to preserve evidence and engagement with external agencies as appropriate
11.4	11.4.1	A plan that identifies and reports cases that provoke serious problems to the company's activities is in place	The plan is used on as regular basis, providing also alternative scenarios and emergency cases
	11.4.2	Emergency exercises and scenarios are implemented,	In these exercises, apart from the local authorities, the company or the charterer participate

		with the participation of external agencies	
	11.4.3	New means to support the communication of emergency responses have been introduced	Some examples of these means are: managing accommodation and transportation of the corresponding – response team and review of the response
	11.4.4	New additional resources to support crisis management are introduced	The resources may include: trained negotiators and family Liaison officers

1.7.12 ELEMENT 12 & 12A – MEASUREMENT, ANALYSIS AND IMPROVEMENT

The main objective of this element is to establish effective inspection and audit programmes that are compliant with the SMS. Analysis of the result drives continual improvement. Its role is crucial for at the core business as a document of high significance.

This element is consisted of the below sections:

Element	Section	KPIs	Best Practice Guidance
12.1	12.1.1	A determined format is used for conducting vessel inspections	The format is controlled through the company document control system
	12.1.2	According to the inspection plan, inspection should be conducted twice a year	Inspections are completed by experienced superintendents, who are responsible for this procedure. After the completion of the process, the superintendents review the outcome of the inspections, and their conclusions are referred in a detailed written report
12.2	12.2.1	There is a standard inspection format which is equivalent to the vessel inspection reports issued by organisations like OCIMF	The format is reviewed according to other industry's formats, and this includes specific details for the company
	12.2.2	A system records deficiencies identified by the inspections and tracks them to close out	After the completion of inspections, the outcomes are recorded, and the deficiencies are identified. In addition, open items regarding the deficiencies are checked and resolved
12.3	12.3.1	An analysis of the inspection results comparisons for the fleet are made, to improve vessel standards	If weaknesses or anomalies are identified, then corrective measures should be taken in order the idea of continual improvement to be adopted. If best practices are identified, then they should be communicated within the organization
	12.3.2	Inspection Analysis results are compared with the data resulting from other similar inspection analysis	The aim of this comparison is to find areas of weakness and differences between the two assessments. After the completion of the comparison, vessel inspection process is reviewed and improved
	12.3.3	Weakness regarding personnel familiarity with	In case that after the publishing of the inspection report, it is concluded that the

		operations and equipment are identified	main cause of the problems is the lack of personnel's familiarity, then this problem should be communicated to the upper management
12.4	12.4.1	Continual Improvement process is always fed by the feedback received from the Inspection report	The data received from the analysis are used for the improvement of SMS, the further analysis and benchmarking against other companies
	12.4.2	Information technology is used to enhance the inspection process	Enhancements include: use of portable devises, purpose built software and application, automated reporting processes

The main aim of element 12A is to establish a detailed process to conduct systematic audits of vessels and company's offices onshore. This element is consisted of the below sections:

Element	Section	KPIs	Best Practice Guidance
12A.1	12A.1.1	Documented audit procedures and audit formats are in place for each company	The formats are established according to ISM, ISPS Code and ISO Standards.
	12A.1.2	Auditors should be appropriately trained and qualified	The auditors must receive the appropriate training and a record of audits must be conducted by them
	12A.1.3	An audit plan covers both vessels and company offices	The plan provides for audits of the entire company organisation and fleet
12A.2	12A.2.1	Management should be notified of the audit results with a specific time frame	A performance goal is set by this procedure for a specified time frame between the time producing the report and the time distributing the report
	12A.2.2	Audits are performed according to the audit plan	Only senior management have the right to approve modifications to the audit plan, after the provision of corresponding justifications for the reason that the audit plan should be modified
12A.3	12A.3.1	All audit non-conformities are closed out within the prescribed time frame	An audit status report must be reported to senior management on a quarterly basis.
12A.4	12A.4.1	Analysis of audit results should be discussed at least once per year. The main aim of this analysis and discussion is to provide enhancement to the continual improvement	The data resulting from the analysis are used to identify new trends, areas for improvement and suggest corrective actions
	12A.4.2	Information technology is used in audit	Enhancements may include: use of portable devices, automated reporting processes etc.
	12A.4.3	Procedures establish the use of a contractor management system	Audit of: shipyards, dry docks and third-party service providers are required for this management system

1.7.13 ELEMENT 13 – MARITIME SECURITY

The main objective of this element is to provide secure working environment. Effective security management requires the systematic identification of risks, and hazards that create problems to the daily operation of the organization. The company should also adopt measures to minimize the level of risk, as possible as it is. A system is in place for monitoring and control of change, as there are continual changes in the legislation and the maritime security situation. The company ensures that:

- There are procedures which ma identify the potential risks and threats
- Measures to minimise the risk are used
- Detailed procedures are in place to report in detail the incidents and the risks
- Risk assessments are undertaken to identify the risks
- Personnel receive appropriate training, promoting the safety culture of the company
- Security procedures are updated with the most recent trends, legislations and guidelines
- Vessels are provided with the appropriate equipment

This element is consisted of the below sections:

Element	Section	KPIs	Best Practice Guidance
13.1	13.1.1	Security plans procedures are established	The plans cover all aspects of activities including: company's activity both ashore and onshore. Personnel etc.
	13.1.2	Procedures are established to identify shore based risks	Examples of possible threats are: vandalism, cargo theft, cyber threat, piracy etc
	13.1.3	Measures have been developed to mitigate all threats applicable to vessels and company's offices	These measures include: access control, security patrols, physical security measures and training
	13.1.4	Procedures are established to incorporate new trends, updates related to security information	The responsible persons review the information and issues relevant guidance to shore-based locations, personnel, and vessels
	13.1.5	Potential security risks and incidents should be reported	These reports include: internal reporting, and reports related to the vessel and the company
13.2	13.2.1	Potential risks will be identified through risk assessments	Risk assessments are reviewed and updated if it is necessary. If increased risk is noticed, then hardening measures are developed to face with this situation
	13.2.2	The corresponding personnel for security must	Training must meet the minimum international legislative requirements. A

		receive the appropriate training to acknowledge their responsibilities	security briefing must also be provided to all personnel as part of their familiarisation process
	13.2.3	Procedures are in place for cyber security risk mitigation and provision of required guidance	Potential risks to company's systems may be created. Some of these systems are identified
	13.2.4	Cyber security awareness is promoted	Responsible behaviour should be encouraged for shore based, and ashore personnel as well as for third parties
13.3	13.3.1	A travel policy to minimise the security threats is used	The travel policy should be taken into consideration and updated in case that there are changes for this policy.
	13.3.2	Security procedures should be updated according to the current guidelines	Guidelines, which include and analyse the latest safety procedures, are provided to all the vessels of the company
	13.3.3	The internal audit programme includes the security policy and other related policies	The audit assesses compliance with all aspects of company security procedures
13.4	13.4.1	Assessments are conducted to measure the security performance	The assessments may be conducted by company's personnel or through outsourcing (by external resources)
	13.4.2	Security threats are mitigated through independent support	Any contracts for specialist support both onboard and ashore, are supported by a detailed scope of work. Such support may be contracted for activities that include training, security and threat assessments
	13.4.3	Security equipment is provided to the vessels	Examples of such equipment are the water cannons, stern radars, thermal imaging systems, keypad entry systems etc.
	13.4.4	New-build designs include the security enhancements that are provided through new technology and innovations	Enhancements and specification may vary according to: vessel type and size, manning levels
	13.4.5	The company performs test for the installation of new security equipment and technology	Measures that should be taken, may be physical or enhancements to IT systems, to improve the security

1.8. REQUIREMENTS FOR THE SUCCESSFUL IMPLEMENTATION OF TMSA

1.8.1 HUMAN FACTOR AND ERRORS

Many accidents and problems in the daily operation, are provoked due to the false estimations and handling by the human capital, as previously has been referred. Human error can be defined as "not intended by the factor; not desired by a set of rules or an external observer; or that held the task or system outside its acceptable limits" (Senders, Moray 1991). The human error can be analysed through two approaches: the human approach, which tries to estimate and identify the errors, the practices and the conditions the errors have been occurred and the system approach which tries to recognize any potential improvements and new practices will contribute to the avoidance of potential errors in the future. Studies have shown the primary factor that results to accidents in global shipping industry is the human element, as 80-85 % of accidents are provoked by human errors. In contrast to the above referred approaches, the human element seems to be neglected by the ship design, a fact that will contribute more to the operational problems and accidents. A new concept has been recently recommended to face with this problem, and its name is Human Centred Design (HCD). This concept focuses mostly on making the required systems usable, by exploiting the knowledge skills and experience of the users, mitigating with this way the risks potential hazards. HCD is a process of systemically applying human factor, and its qualifications, trying to enhance the working conditions, the effectiveness of the personnel, and ensure the minimum healthcare provisions to the employees.

1.8.2 HUMAN ERRORS CATEGORIES

There are three main categories of human failures which can lead to major incidents. The first category is the Errors (slips/lapse), that are unpredicted human actions. These may occur during the fulfilment of an ordinary task and may not be eliminated by training. The second category is the Mistakes, which are also errors, however, result from judging or decision-making, in contrary to the common errors. These appear when behaviour focuses on rules or procedures and therefore decisions lead to miscalculations or misdiagnoses. The first two categories are referred as unintentional errors. The third category is the violations which differ from the other two categories is that these errors are intentional failures, usually meaning most of the times, are rarely wilful and usually are characterized by the tend to complete the task or the assigned job despite the consequences. The category of violations is divided to three subcategories, which are the below:

- Routine Violations: A behaviour of an individual or a group which is against the rules and policies and tends to be the standard way of behaviour within an organisation

- Exceptional Violations: The violations happen in special and extraordinary circumstances, when something goes wrong in unpredicted cases, for example an emergency situation
- Situational Violations: These violations result of factors led by personnel's working environment and immediate work space.
- Acts of sabotage: These are not as frequent as the other subcategories, however their causes are more complex ranging from rules violation to vandalism and terrorism.

1.8.3 EFFORTS TO REDUCE THE HUMAN ERRORS

Shipping operations are designed according to certain criteria, rules, regulations which are determined most of the times by the flag state's authorities or by the classification societies. Several documents are listed in shipping industry, which are used, regarding the design, the hull form and human- machine interface. In an attempt to mitigate the risk, many companies have developed a new methodology integrating a risk-based approach relating to ship designs and ship systems. However, the human factor and how the errors are related were not included in this methodology. This gap between the methodology and the human error was eliminated through studies which summarized that the main causes of the errors, which have a huge impact to human behaviour, were ship motion, noise, and vibration. Ship motion is identified as the most significant factor, having an impact to crew's behaviour, and disrupting the sleep quality. Approaches to mitigate and prevent adverse effects of ship motion to crew were designed and suggested. These approaches were divided into five categories: ship design and system engineering, human factors engineering, enhancing natural human resistance to motion effects, modifying adverse physiological reactions to motion and operation solutions.

There are three serious concerns about the management of the risk and human capital errors, which are: an imbalance between hardware and human issues and focussing only one engineering (concern 1), focussing on the human contribution to personal safety rather than to the initiation and control of major accident hazards (concern 2) and focussing on operating errors on behalf of system management failures (concern 3).

Concern 1: Due to the increased accidents resulting from the human failures, there is more focus on engineering and hardware aspects. However, the exclusive use of engineering is not absolutely riskless. The concept of automation has been incorporated in the majority of the systems, however most of them are designed, developed and maintained by the human capital.

Concern 2: The following diagram provides us with information focusing on the management system on major hazard cases:

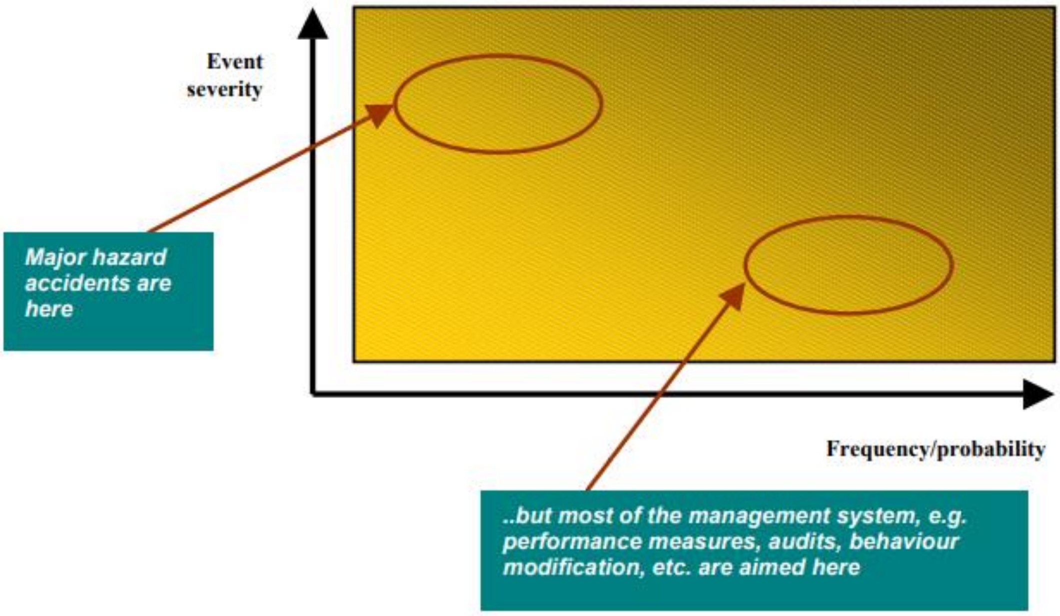

Figure 4: Management System and Major Hazard Cases (Jackson, 2018)

From the above figure we conclude that the majority of hazard sites tend to focus on occupational safety and those sites considering human factor issues rarely focus on those aspects that are relevant to the management of major risks. For example, sites consider the personal safety rather than how human errors in maintenance operations are the primary cause of major accidents. In general, a safety management system which does not manage the right aspects, has the same operational role in controlling accidents as well as the no use of any system.

Concern 3: In complex systems, the operation and the required practices focus on the actions of most operators. Nevertheless, operators often tend to fail making organizational and management failures. The management and organizational factors must be firstly considered and then responsibilities must be assigned to the corresponding operators. Furthermore, the concept of safety culture must be considered as an appropriate element for the effective mitigation of the risk. For this reason, management should understand that the establishment and communication of the safety culture across the organization must be a task of high significance, assigned to them, following the investigation of new accidents.

Many methodologies and procedures have been designed and developed to mitigate risks relating to human capital. Some of the most frequent procedures used in the management of human capital are referred below.

1.8.4 SAFETY CRITICAL TASKS

An example of these methodologies is Safety Critical Tasks. These are related to a process, which identifies those tasks associated with potential hazards, where human capital may fail to report hazards and mitigate the risks of them. Furthermore, this procedure will involve the identification of safety critical rules and responsibilities of personnel within the organisation.

1.8.5 MAJOR ACCIDENT HAZARD SCENARIOS

These scenarios try to determine potential hazards and the consequences resulting from them under special and extraordinary circumstances for the organization. After the completion of the assessment process, a safety report which includes the conclusions is produced. For sites of the organization that have not produced this report, the main hazards may be identified by a risk management system.

1.8.6 TASK ANALYSIS

If an organization has identified the safety critical tasks, then a task analysis must be conducted in order these tasks to be analysed and understood. Task Analysis may be conducted through informal conservations between management and employees, to identify the hazards, the time, the way and the conditions under which, the human errors occurred. Conservations may include new practices and suggestions provided to the personnel, to avoid similar situations in the future. For more complex responsibilities and situations a more formal task analysis is required.

1.8.7 HUMAN ERROR ANALYSIS AND PIF

If the personnel's tasks have been identified, each task can be assessed for the potential of human failure and the opportunity to recover from human failure. After the completion of Human Error Analysis it is important to consider those factors that which contribute at a high level to the human capital's failure or not. The name of this procedure is Operational Performance Influencing Factors (PIF). Examples of this procedure are: Ergonomics Design, and Human machine interfaces.

1.8.8 ENGINEERING – AUTOMATION CONTROLS

The first step of this process is to engineer out the human failure and provide further protection which do not rely on human factor. In addition, the continual assurance must be audited and tested in a constant basis.

1.8.9 INSPECTION, TESTING AND MAINTENANCE

Replacing human capital with engineering systems does not remove the personnel's responsibilities and tasks from the risk management system. The main role and scope of these systems are to mitigate the risk and human capital failure away from the operational activities and into Inspection, Testing and Maintenance.

1.8.10 TASK ANALYSIS (MAINTENANCE)

This process has the same characteristics and steps as the procedure of Task Analysis, referred above. The only difference between the two processes is that Maintenance Task Analysis is that it may identify latent errors which may not result to immediate failure.

1.8.11 PROCEDURES

Procedures have a significant role in determining the personnel's safety critical tasks. The process of task analysis includes detailed description for the assignment of responsibilities to the human capital, which can be easily converted to formal procedures – description of tasks within the organisation. The main aim of the procedures is to identify possible gaps in knowledge, which drive to mistakes and as there are different types of procedures, the human failures may be controlled more effectively. Simplified, detailed procedures and job aids like checklists, provide controls for potential lapses and must monitored very frequently.

1.8.12 TRAINING

In the TMSA elements, the role of Training for both onshore and ashore personnel was analysed. It is a significant factor which contributes to the effective implementation of the procedures and appropriate risk management. Adequate training and development of the employees will help to avoid future harmful situation, with a negative impact to the organisation. It also provides with the required knowledge for the personnel to carry out the safety critical tasks. A complete training program also includes information on why the understanding of a major hazard risk is necessary. Training can also be related with the procedures, as the description of how a task can be completed, can be converted to a detailed training manual, which is very helpful for the personnel.

As IMO and the global community have understood the significance of training for the personnel, a range of training programs have been introduced to cover all the potential needs for the development of the employees. Two main categories of training programs have been introduced: shore-based and shipboard trainings.

Shore-based trainings: Companies try to offer their personnel all the up to date knowledge, being aware of all the changes in the market, and new legislation. It is very significant for the employees to be aware of the current trends in the shipping industry, due to the fact that shipping is a highly volatile field of the economy, with consecutive changes. Some of the topics covered by the training programs are:

- Changes in the current legislation and estimations of potential changes in the future
- Management reviews
- Operational, safety, environmental issues etc.
- Customers’ complaints
- Company strategy, aims and philosophy
- Security and cyber security
- Accidents - incidents investigation, analysis and conclusions

Shore-based trainings may include and other subcategories like: Company Run Seminar, and Company In-house Refreshment Training.

Shipboard Trainings: For this category it must be referred that the Master has the responsibility for the successful implementation of the training program. If there is need for additional training, then the program and the requirements may probably change. Master must ensure that all the requirements and the legislation imposed by the flag-state, are met. For example, tanker companies follow methods like: Familiarization Trainings, during which all the seafarers are provided with the training as referred to the following table:

Familiarization	Master	Deck Officer	Chief Eng	Engine Officer	Ratings	3rd Party Contractor
Elementary Basic Safety Familiarization	24 hour	24 hour	24 hour	24 hour	24 hour	
Specific Shipboard Familiarization	2 weeks	2 weeks	2 weeks	2 weeks	2 weeks	
Engine Room Familiarization			First week			
Cargo Control Room and Cargo System Familiarization		First week				
Bridge and Bridge Equipment Familiarization	Before first watch	Before first watch				
3rd Party contractors & visitors Familiarization						On arrival

Figure 5: Familiarization Trainings (E. Bal Besikci1, 2019)

Additional training programs are included in shipboard trainings like: Onboard Computer Based Training (CBT), Training During Drills, Brief Meetings, and Training by Superintendents during shipboard visits.

Onboard Computer Based Training (CBT): Companies should include a training matrix to cover all rank ranges of crew members. For the successful implementation of this training, the required equipment must be ready to be used (such as computers or other PC devices). Additional material, like training videos or courses will help the Master or the management to complete the trainings effectively. Explanations or comments about the assessments may be required to be submitted by the Master.

Training During Drills: Real-life scenarios should be reflected by Training During Drills, and should be considered as realistic, as they are held with the hypothesis of real-time conditions to be taken into consideration. After the completion of the process, a brief meeting should take place, to identify corrective actions and possible improvements. Through these trainings, the crew will focus on emergency procedures of the vessel, and emergency duties - responsibilities, will be educated about the content of different global conventions, like SOLAS, Life Saving Appliances (LSA), Fire Fighting Equipment (FFE) and operation of fire-extinguishing appliances.

Brief/Debrief Meetings: Brief/Debrief Meetings offer the opportunity to the personnel to discuss about the risks, the emergency scenarios, and what goes wrong after the completion of an operation. A Brief Meeting takes place before the commencement of the operational process and is characterized by a discussion about possible risks and the precautionary measures to be taken, to avoid the risks in the future. The Debrief Meeting takes place after the completion of the operational process and its aim is mistakes, which were identified during this procedure and corrective actions to be discussed, in order to avoid similar failures or problems in the future. Both of the above meetings focus on: operations before and after the voyage, unmooring and mooring operations, cargo operations, bunkering operations, anchoring operations etc.

Training by Superintendents during shipboard visits: This program includes training for superintendents, who are joining the vessels and the necessary training is required to be completed, in order to improve the performance level of the vessel. Some of the objectives of this program are: the maintenance of the operational safety, ensuring that the crew is familiar with HSSEQ policies and SMS, improvement of the crew's awareness on environmental issues and reinforcement of the company's safety initiatives, campaigns and programs.

1.8.13 CONSOLIDATION

The knowledge obtained by training program must be incorporated and applied to each job, in order to develop the skills and complete the tasks safely and successfully. During the consolidation period, trained people will need extra support from good procedures and supervision.

1.8.14 COMPETENCE ASSURANCE, MONITOR AND REVIEW

An effective Competence Assurance System should monitor the performance and how the personnel will respond to standards of performance and predetermined criteria. During the full operation of an organization, many administrative changes may occur to the structure, number and characteristics of the employees. Management reorganisations, and modifications to existing plants may also occur. To keep up with these changes, the risk profile of the organisation should be estimated after the changes, the demonstration of assured performance of human capital engaged on safety critical tasks should be reviewed.

1.8.15 ASSURED HUMAN PERFORMANCE

Having completed all the precedent steps of the human errors handling, it should be possible to provide evidence to demonstrate the assured performance of personnel engaged on safety critical tasks, which have an impact risk mitigation. The produced safety report for human errors has to include the above as its main demonstration. Having firstly determined the steps required for the Task Analysis, Human Error Analysis etc., a more structured - systematic approach can be demonstrated, which will be clearly communicated through the safety report to make the necessary demonstrations that the measures taken will contribute to the avoidance of human errors in the future.

The below figure shows all the methods analysed, and summarized above and how they are related to each other:

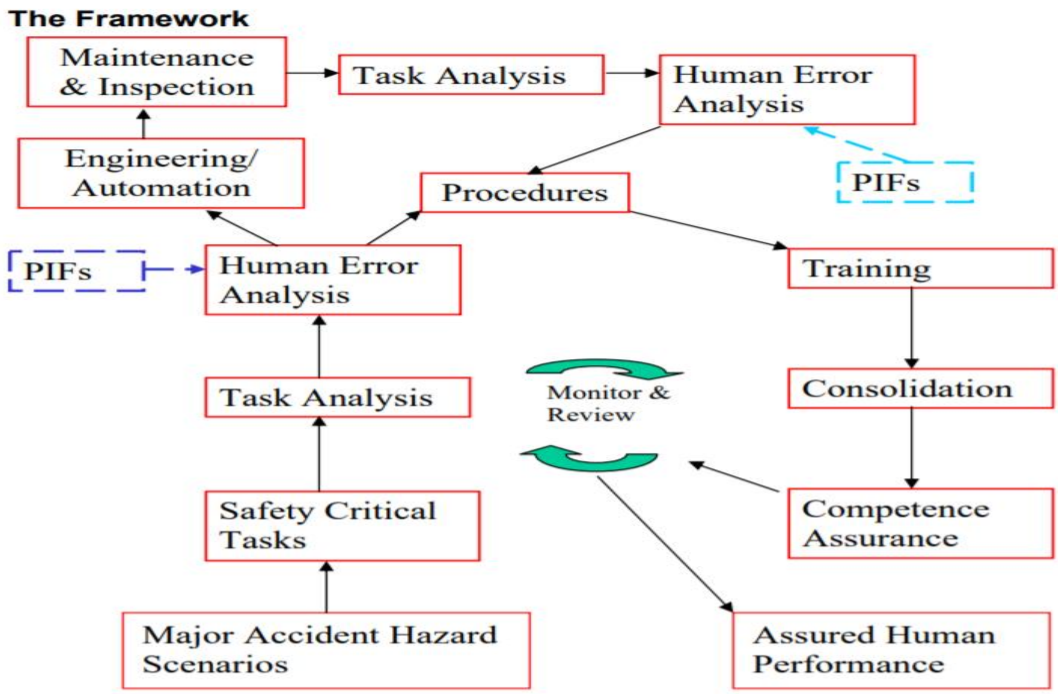

Figure 6: Methods used for the effective implementation of TMSA (Jackson, 2018)

1.8.16 STOP WORK AUTHORITY (SWA)

SWA is an essential element for the successful implementation of the procedures defined by the organization and has a significant relation with the implementation of TMSA. SWA is defined as an element of SMS and was incorporated to the management system after an increase in the maritime incidents. Typically, is a concept that let employees to provide with their opinion and express their concern, when there is a problem with the operation, a failure has occurred, a task is not undertaken according to the safety policies and rules. If an employee recognizes a failure, he should directly refer the case to the upper management for further consideration. Practically, SWA places authority and responsibly on each member of vessel's crew. It is very difficult for the SWA to be implemented without vacuum. The team spirit and the encouragement approach must be communicated to all the personnel. It is very significant these concepts to be adopted by all the employees, as the effectiveness of the SWA is depended on it. Merely posting the policy on a bulkhead does not constitute an effective implementation. A good starting point for the implementation of SWA is the recalling of previous similar cases, form the past, when an employee stopped his tasks after the release of a new issue. A SWA program must define all the responsibilities and roles, which are the below:

- Senior Management: Creates a culture that defines exactly the responsibilities and the roles. In addition, Management must resolve conflicts for SWA issues and ensures that all the personnel is compliant with SWA procedures and standards.
- Managers and Supervisors: They should promote a concept and culture, where SWA is exercised, without disruptions and resolved before the operations are completed.
- HSE Department: The main aim of this department is to ensure that compliance with SWA program is satisfied, and training or support is also provided
- Company employees and contractors: They should stop work to meet the requirements of SWA and support the stop of other employees when there is a need for the consistency of SWA.

The monitoring and identification of the conditions, under which SWA must work, is very significant, because they will increase the risk and threaten danger to the company’s operations. Such conditions are: changes to the scope of working plan, emergency situations, lack of knowledge, understanding and information, and unsafe conditions. The steps for the successful implementation of SWA are the below:

- Stop: When an employee perceives cases that pose danger to the equipment, the organization or the environment he must initiate a stop work procedure with the personnel subject to risk.
- Notify: Under this step, the affected personnel and management must stop working, if their tasks are affected by the potential risks. Removing of the personnel subject to risk, is a recommended alternative solution to stabilize the situation and ensure that the risk is monitored.
- Investigate: All the affected personnel will reach an agreement and stop the work action. If there is an agreement between all the affected personnel, then the safe concept of thought is to proceed without modifications, and the affected personnel should show appreciation to the SWA and then resume work. If the SWA is valid and then accepted, a stop work form should be filled out. If the issues provoking problems to the equipment, organization or environment have not been resolved, then the work is not permitted to restart. Working tasks will remain in suspension status, until the issues are resolved.
- Correct: Corrective actions should be made according to the improvements that are suggested in the Stop Work Issuance Form. After the completion of the process, the improvements and changes will be assessed by experts to estimate whether the conditions let the work tasks to resume.
- Resume: The affected areas will continue the working tasks, according to the restart authority. All the personnel should be notified that the working tasks will restart, which issues have been resolved and what changes have been made.
- Follow-up: The management will conduct an analysis and identify other potential opportunities for improvement. The Safety Manager will publish the outcomes of this analysis, including the issues, the improvements and

the suggested actions for the working tasks to restart, and of course to remind which the issues are to be avoided in a similar future situation.

1.8.17 BEHAVIOURAL COMPETENCY ASSESSMENT SYSTEM

The shipping industry faces with many changes in legislation, operations and potential risks, as these have previously been referred. Personnel in order to achieve to meet the requirements, requested by the organization, must have received the appropriate training and acquire new experiences and both technical (hard skills) and non-technical (soft skills). Especially, Tanker sector recognizes that the personnel should focus more on soft skills. Thus, a behavioural competency assessment system is required to be developed. Competence framework provides a common approach for assessment of skills, improvement of performance, recommendation of corrective actions and promotion of organization's culture. The competency framework is consisted by six fields, analysed below: Team working, communication and influencing, situation awareness, decision making, results focus, and leadership – managerial skills.

Team Working: This section is characterized by building effective working relationships, treating others with respect, resolving conflicts between the employees.

Communication and influencing: Daily communication is required between all the personnel, especially between the employees and the managers. Effective interaction and communication is a prerequisite for the organization's survival.

Situation Awareness: All the personnel must distinguish the external and internal factors that have an impact to the daily operations. Effective strategies must be developed to manage the future threats and mitigate the risks.

Decision Making: Systematic and rational judgements are chosen based on drawn conclusions by analysing relevant issues and through the benchmarking process taking place within the organization.

Results Focus: Focusing on achieving the best and most effective results is highly desired by the organization. Flexibility, emotional toughness and using initiative and energy are also required. This section is also characterized by accountability, and dependability.

Leadership and Managerial Skills: Personnel must be empowered to perform at their best and complete their tasks effectively.

The sections of a five-rating scale assessment are the below:

- **Exceptional:** This section is recognized as outstanding in this competency, the performances must exceed the expected results and its role is crucial in order to ensure that the required level of competence is accomplished.
- **Exceeds expectations:** Under this stage, the assessment is based on try to exceed the expected results to help others to develop this competency. It meets all and often exceeds expectations.
- **Meets Expectations:** The expected results are consistently met. The level of competency is demonstrated, and expected results are awaited to be met. Furthermore, this stage is reliably and consistently successful.
- **Needs improvement:** The competency, in order to meet the expectations and the required levels by the management, needs further development, guidance or evaluation and sometimes meets the expectations. Corrective actions may be required to be taken to strengthen the competency and achieve better results.
- **Unsatisfactory:** In this stage, expectations are not met and regularly fail to achieve the required results. Furthermore, behaviours are inconsistent with this competency and further training, and analysis for the inconsistencies of this competency is not undertaken.

1.8.18 THE IMPACT OF CONTINUAL IMPROVEMENT PRACTICES TO TMSA

All the above practices which have been analysed, contribute to the effective implementation of the TMSA. Trying to minimize the risk resulting from the human factor and the failures resulting from its tasks, organizations have developed many practices to face with the potentials of the risks. The tool of TMSA was designed in order to identify these potentials, escalate them to the management and reach the correct decisions for the organization. TMSA only recognizes the risks and measures the capability of the organization to achieve to deal with these risks. However, TMSA is not the tool that can change the safety culture, develop the personnel's skills and introduce new concepts to organization's culture. The corrective actions, changes and improvements will be completed through the above practices, like training, SWA, Task Analysis etc. Therefore, many of these practices are included in the TMSA Best Practice Guidance. To sum up, TMSA is used for the identification of the risks and the insufficiency of the organization to respond to risky situations, as the practices included in the Guidance may help the organization to escape from this situation and achieve the risks reduction.

1.9. PERFORMANCE MEASUREMENT & MANAGEMENT

1.9.1 PERFORMANCE MEASUREMENT

Performance measurement is used from many organizations as a method to measure performance, the effectiveness of this organization, and its main aim is to evaluate how well the companies achieve their aims. KPIs, Performance Indicators (PI), Key Result Indicators (KRI), and Result Indicators (RI), are used by the organizations in the stage of performance measurement, to estimate the organization's results and performance. Due to the fact that KPIs have analysed, as they are used in TMSA, we will focus more on other performance indicators.

Result Indicators (RI): RIs provides with a summary of the activities and actions taken by the teams, cooperating together and producing the final result. RIs focus on the practices and ways that are used for the coordination of the teams and how effective the team-work will be. These indicators may be also used to estimate the financial performance. Examples of these indicators are: yesterday sales, number of educated workers (for the use of a specific system), and complaints from key-customers.

Key Result Indicators (KRI): A KRI is an indicator which is used to compare the activities of various teams and departments across an organization. The main disadvantage of these indicators is that they do not provide with the reason of taking an action, but only provide the results of the action. Therefore, this information is reported too late to take an action and report further.

Performance Indicators (PI): PIs are non-financial indicators that refer to a specific, process, task, team or an employee. PIs are very vital for the company's organization (not so important for the company's overall wellbeing), as they set the principles regarding the company's strategy and policies.

1.9.2 LEADING AND LAGGING INDICATORS

Another classification of the performance measurement indicators is their division to: Leading and Lagging Indicators. A lagging indicator focuses more on past performance and conclusions are drawn about the past activities and which were the faults of the organization. Leading Indicators focus more on future performance, making predictions and affecting the future activities, operating as a proactive measurement.

1.9.3 PERFORMANCE MEASUREMENT INDICATORS AND COMPANY'S STRATEGY

One of the most significant aspects for the use of Performance Measurement Indicators is that they should be compatible with the organization's strategies, according to factors and objectives of sucess, ensuring that drive the company to the right direction. Many studies have shown that KPIs are cascaded usually in two or three organizational levels. However, two approaches are the most predominant for the cascading of performance indicators: vertical cascading and horizontal cascading.

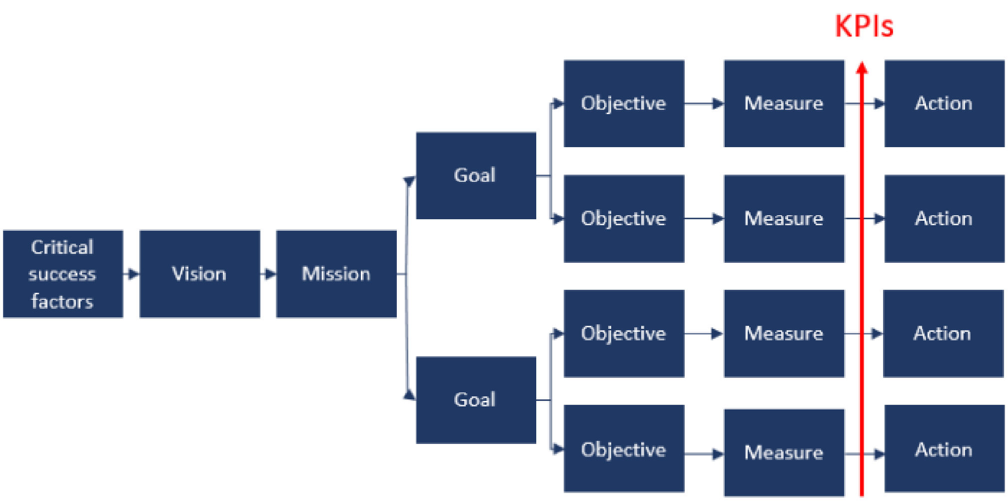

Figure 7: Performance Indicators & Strategy (Philip Sundström, 2018)

The above figure explains in detail how performance indicators, and especially KPIs are aligned with strategy.

Vertical Cascading: The main idea of this process is that the strategy is rolled down in the company, as well as the metrics are rolled up. This method provides the management the opportunity to control the actions and the implementation of the procedures across all the levels of an organization. It should also be referred that there are many methods to roll up metrics. An example of this methods is adding two lower-level measures to one higher level or by deriving lower-level measures, as for the same activity that might be measured in different ways.

Horizontal Cascading: This method aims to align the KPIs between dashboards and scorecards to achieve the required coordination.

There are many methods developed for the performance measurement, with the most significant the Performance Measurement System and the SCOR Model. Performance Measurement System is a tool which is used to monitor and evaluate the company's performance. Many approaches and editions of PMS have been developed, however the most predominant is these that promotes the connection of strategic objectives with performance indicators and metrics across multiple levels. Performance Measurement System can also connect targets, goals and actions across the company. In addition, PMS can be divided to many categories according to specified criteria. Some of these categories are: vertical or hierarchal systems, systems operating with more different perspective like scorecards, models that are distinguished between internal and external performance, and models that are related to value chains, taking into account the internal customers. Another very known system is the Scor Model, which is consisted of five components: Plan, Source, Make, Deliver and Return. Plan is referred to the processes that are linked to planning, sourcing, and delivering according to the demand. Source processes are related to procurement of materials, so that the company's products and services can meet the demand. Make processes are linked with the transformation of inputs to a complete final product or service. Deliver processes ensure that all finished products are delivered according to demand. The Return processes are related with the handling of the return of products to suppliers. There are three levels of metrics, analysing the effectiveness of the system, included in SCOR Model. Level 1 includes all the strategic KPIs, Level 2 has a supportive role to Level 1, helping to identify the causes and the roots provoking different issues, and Level 3 also has a supportive role for Level 2.

1.9.4 PERFORMANCE MANAGEMENT

Performance Management is the procedure of use of performance measurement information to provide with recommendations for improvements and corrective actions to company's structure, processes, and culture. KPIs are an important part of performance management, as guidelines are provided by this method's system framework on the way of measurement and performance management. This framework is a suitable starting point for the development of a measurement system. Performance management is consisted of four different steps, which are: the creation of strategy, planning of how to achieve strategies, monitor execution of activities and plans and making of adjustments and activities on problems. Performance Management is consisted also of 3 levels. In Level 1 there is a focus on visualizing the measurements. Some initial KPIs are included in visualization reports and tools. The measure that are used may not be compatible with the strategic objectives. Level 2 focuses on management of the performance. Measures are taken at this stage, which are used to identify issues, suggest improvements and monitor performance across all the teams of the organization. Finally, in Level 3 the measures are used to achieve strategic goals and objectives, according to both lagging and leading indicators. Furthermore, an analysis between behaviour and outcomes is conducted.

1.9.5 PERFORMANCE REPORTING

Upon completion of Performance Measurement and Management processes, reporting tools are required to ensure that the conclusions drawn after these processes are reported and communicated directly and effectively across all the organization. Definition Sheet is one of these tools and provides with a record of all the indicators satisfying and explaining to the personnel how these indicators are handled, how they work, and which is their significance. Other, with similar use, tools are the balanced scorecard and dashboard, the primary aim of which is to report the metrics after the completion of researching of performance measurements. Balance Scoreboard is one of the most commonly used PMS models, as it incorporates detailed perspectives into the performance measurement. The Dashboard, in contrast to Balance Scoreboard, focuses more on short-term goals, as the Balance Scoreboard focuses more on long-term goals. Therefore, a dashboard may evaluate the organization's performance in real-time frame and are used by the management to achieve these goals. This tool is also very helpful when the management tries to visualize the data.

1.9.6 PERFORMANCE & KNOWLEDGE MANAGEMENT, BUSINESS INTELLIGENCE

Nowadays, there are many challenges for an organization to survive and grow up across a highly competitive market and among other organization or companies, which try to increase their profits, minimise their risks and enhance their market share. Consequently, the companies must have and develop a comparative advantage to be determined as the dominator of the market. As the organization emphasizes more on the significance of the human factor, the development and the required knowledge and skills, new tools have designed such as the concept of performance management (previously analysed), the business intelligence and the knowledge management. These tools are expected to be implemented more effectively in a modern business environment, where performance management is related with the implementation of the organization's strategy, business intelligence is related with the procedure of data gathering and their analysis and knowledge management is required for the management of competencies and information within the organization.

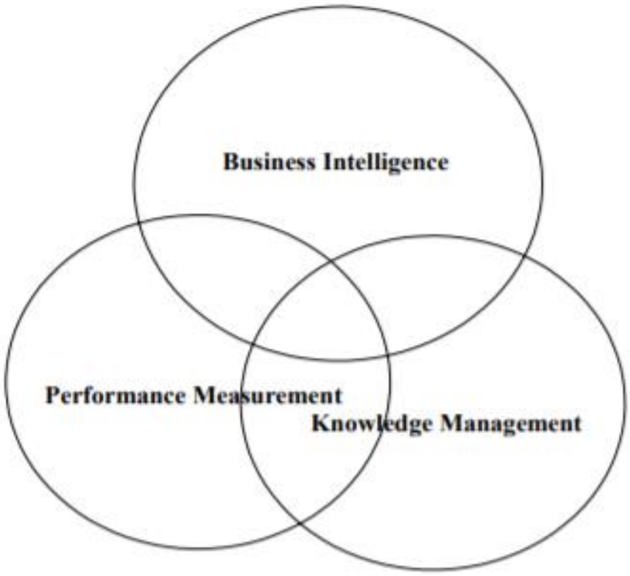

Figure 8: Business Intelligence, Performance Measurement & Knowledge Measurement (Jussi Okkonen, 2018)

The above figure shows us how the three referred tools are related with each other, and how significant is the procedure of each tool for the implementation of the other procedure. Knowledge Management, in more details, is the process of managing knowledge in organizations and tries to maximize organisational performance by creating, sharing experience from external and internal sources. Furthermore, this system is required for the improvement of organization's efficiency by providing framework changes, new tools and techniques for capturing the intellectual assets. Knowledge management is not a tool that will solve all the problems regarding the communication of the problems, the information providing and the detection of the deficits of knowledge, which are noticed. However, the utilization of this system will help in ensuring higher performance and efficiency for the organization. The greatest benefit which is provided through the use of the knowledge management systems is that it does not face with the time waste, in contrast to other organizations that do not use this system. Business Intelligence is defined as one of the applications that are used for enabling the active and passive delivery of information, by turning received data to actionable intelligence, through converting specifically data, information and knowledge to valuable information, acknowledged as intelligence. Through BI tool, new knowledge is also gained about important matters and around the organization in order to provide more information to decision-makers. Comparing performance measurement, knowledge management and business intelligence, it is noticed that there are many purposes for the use of each tool. In case that the organization operates for a short-term period, the rationale for using these tools is presented below:

Performance Measurement: The main rationale in this circumstance is the motivation, control and guidance quality management, personnel etc. In this case TMSA is used as a performance measurement system.

Knowledge Management: Effective knowledge is shared between the personnel and knowledge level is estimated, and if any enhancements – changes are required.

Business Intelligence: Better and well established information is provided within the organization.

If the organization operates for a long-term period, then the rationale for using these tools is presented below:

Performance Measurement: Implementation of the strategy and feedback is received for the formulation of the strategy. In this case TMSA is also used as a performance measurement system.

Knowledge Management: Employees' competencies are developed according to the implemented strategy.

Business Intelligence: Gaining knowledge about important matters and around the organization that make emergent strategies invalid.

All of the three tools are used simultaneously within an organization, unnecessary, as well as, overlapping activities are eliminated and the tool tries to leverage the each of the three tools' contribution to the total performance. Effective knowledge management requires continuous performance measurement. Measurements are mostly required for the continuous improvement set by the organization and make the required knowledge more apparent for all the personnel related with it. Performance Measurement and Knowledge Management are internal processes and components of each process are dependent to each other. The connection between measurement and business intelligence should be identified by comparing an organization to other organization, as performance management is used for generating data for the BI system. This process is defined as benchmarking procedure. Performance measurement should not be conducted if comparison of performance with the performance of other organizations is not undertaken. When BI tool is used effectively, it generates a wide database, while processing in BI is also required to convert data from information into intelligence. BI presents a future perspective which is used for gaining the comparative advantage against the other competitors. Performance Measurement and BI are connected with each other, as well as important information on the knowledge is mediated to the business intelligence process within an organization. Secondly, Knowledge Management is used to manage the competencies. BI is connected to knowledge management, as well as information is derived through the BI process into personnel's knowledge. Thirdly, it should be referred that performance measurement is firstly used for strategy implementation, while there is a focus on critical success factors and performance drivers. Measurement is very important due to the evaluation of sufficient levels. Furthermore, it is used for strategy formulations at the same time with business intelligence.

1.10. TMSA IMPLEMENTATION IN SHIPPING INDUSTRY

1.10.1 METHODOLOGY OF THE SURVEY

In an attempt, to understand how TMSA works in a real time basis across Shipping Industry, we conducted a survey using real data and answers through a survey undertaken with executives from the industry, through filling out a short-time questionnaire. In this section of our survey, we tried to be aware of which TMSA element is considered more difficult to be adapted, how the companies achieved to incorporate the changes from the previous editions of TMSA to the current edition, which element is measured with the lower ratio and which element is measured with the higher ratio most of the times. Furthermore, in our survey the participants had the opportunity to answer 10 questions regarding the elements of the TMSA, the difficulties they face, how sufficient is the education and development the personnel receive, and which is the element which is considered the most significant for a shipping company. Participants filled out the questionnaire with all the included questions, filling out and their current job position, in order to draw the appropriate conclusions according to the participants' job specification, knowledge and expertise in the industry. The survey took place for 20 days, from 18.11.2021 to 08.12.2021, and 21 participants filled out our questionnaire. Some of the questions gave the option to the participants to select one of the TMSA elements for their answer and other questions gave the option to select an answer from a grade 1 – 5. After the completion of the survey, all the data were gathered and the conclusions were presented, comments added for the outcome of the survey and conclusions were drawn for the implementation of TMSA. The ten questions which included in the survey were the below:

1. Which TMSA element is considered the most difficult to be implemented in a shipping company?

2. Which TMSA element is considered the most significant for a shipping company?

3. How difficult is for a shipping company to implement TMSA efficiently?

4. Is there any increase in company's operating costs from the implementation of TMSA?

5. Have you received the appropriate training, empowerment of your skills according to TMSA criteria?

6. Do you consider that the results of TMSA have an impact to the charterer's decisions and/or the shipping market in general?

7. Are changes and the new edition of TMSA 3 sufficient for the estimation of the shipping company's risk?

8. Which TMSA element is considered the most significant from the aspect of external stakeholders (like charterers, flag state authorities, investors etc.)?

9. How efficiently the onshore personnel adapt and implement the TMSA elements?

10. How efficiently the vessel's personnel adapt and implement the TMSA elements?

1.10.2 THE OUTCOME OF THE SURVEY

After the completion of the survey and the submission of the answers by all the participants, we gathered the data and tried to analyze them. Firstly, we tried to ensure that the majority of the participants have a working experience or are currently working in shipping industry. Students with undergraduate or post-graduate students were also welcomed to fill out the questionnaire. From the 21 participants, 17 participants were related with shipping industry (81 %) and 4 participants were not (19 %), as the below figure shows:

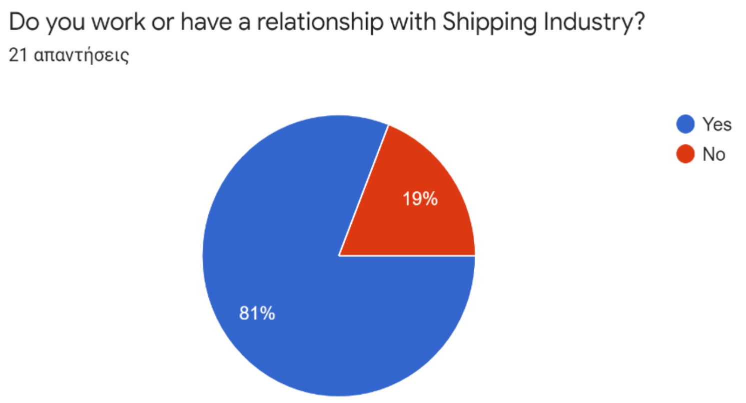

Figure 9: Distribution of survey participants, according to their professional background

Furthermore, we tried to locate the professional background from the participants in order to estimate in which departments the participants belong to, and which department was the predominant. From the below figure, it is concluded that the majority of the participants come from the operations and chartering department, including 6 participants overall, and the minority of participants come from the HSQE and Freight Collections Department.

Figure 10: Relationship with Shipping Industry

Furthermore, it is also concluded that the majority of the participants, have worked in Shipping Industry for 3-6 years at a percentage of 52.9%. The percentage of participants with 0-2 working experience was 29.4%, while the percentage of participants with 7+ working experience was 17.6%. These details are included in the below figure:

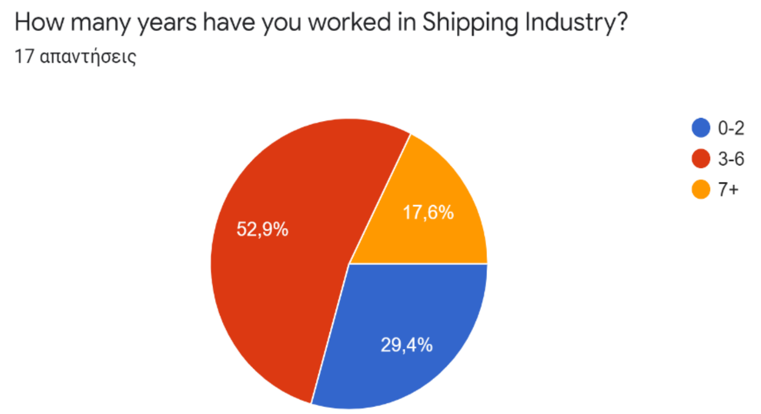

Figure 11: Years of professional experience

After the submission of the answers regarding the background and the general characteristics of the participants, they tried to answer 10 general questions related with TMSA. For the first question 'Which TMSA element is considered the most difficult to be implemented in a shipping company?', the majority of the participants answered that element 3 is considered the most difficult to be implemented as is shown in the below figure:

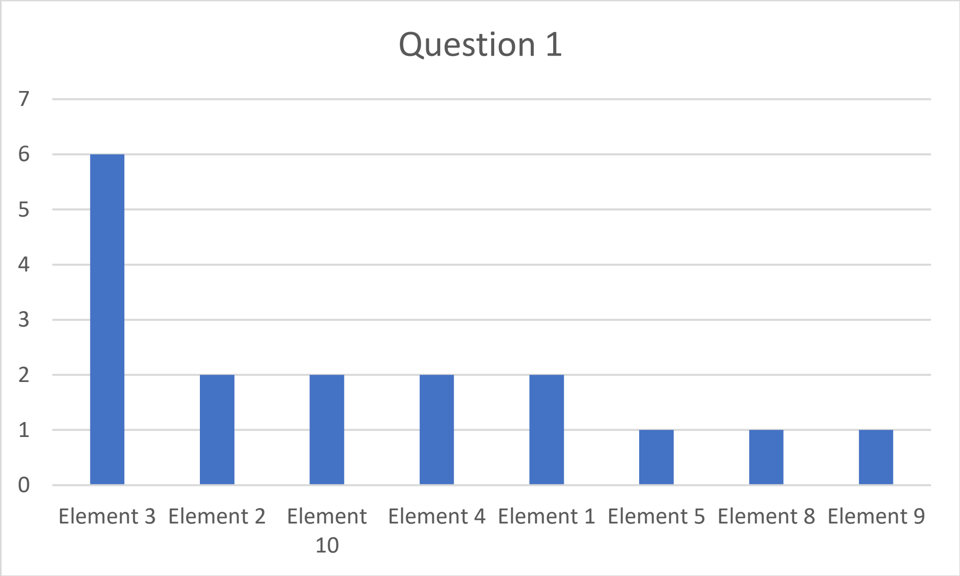

Figure 12: Which TMSA element is considered the most difficult to be implemented in a shipping company?

However, elements 5,8 & 9 were considered difficult to be implemented at a lower level than element 3. For question 2 ‘Which TMSA element is considered the most significant for a shipping company?’, the majority of the participants selected the element 3 again for their answer, exactly the same as in question 1. They consider that this element, which is related with the recruitment and management of the vessel personnel, is both the most significant and the most difficult to be implemented for a shipping company. The figure below provides us with these details:

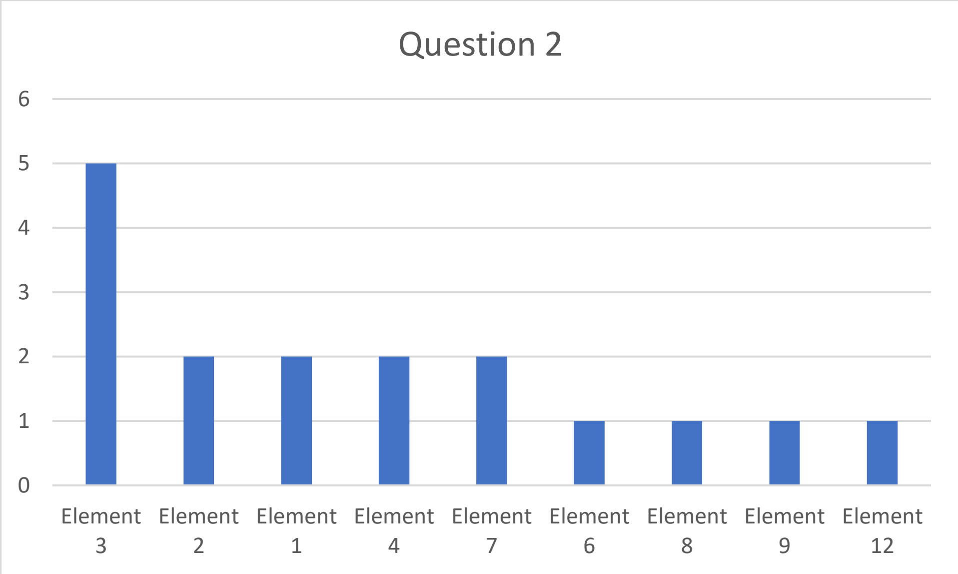

Figure 13: Which TMSA element is considered the most significant for a shipping company?

Details about question 3 are included in the below figure:

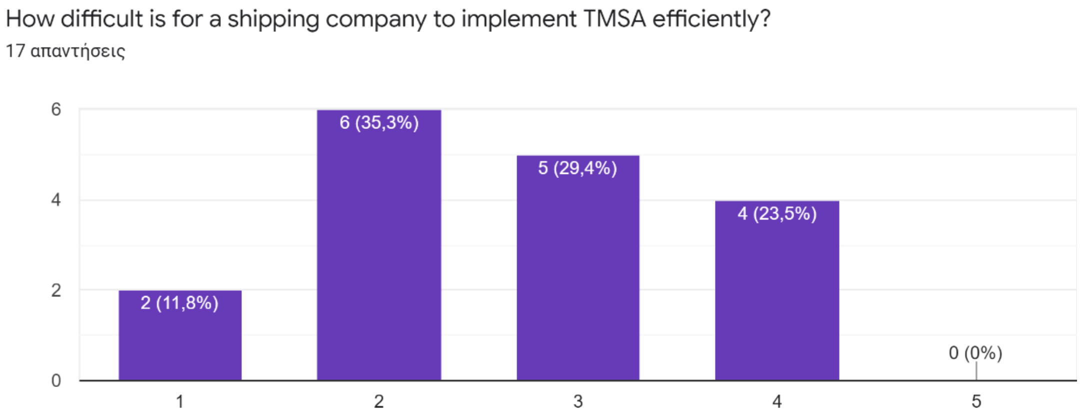

Figure 14: How difficult is for a shipping company to implement TMSA efficiently?

We noticed that the majority of the participants believed that the implementation of whole the TMSA is not extremely difficult, and the shipping companies have the ability to incorporate TMSA to their management systems. Participants believed that TMSA is implemented in a moderate level of difficulty, as explained in the above diagram. The following figure shows the results for question 4 ‘Is there any increase in company’s operating costs from the implementation of TMSA?’:

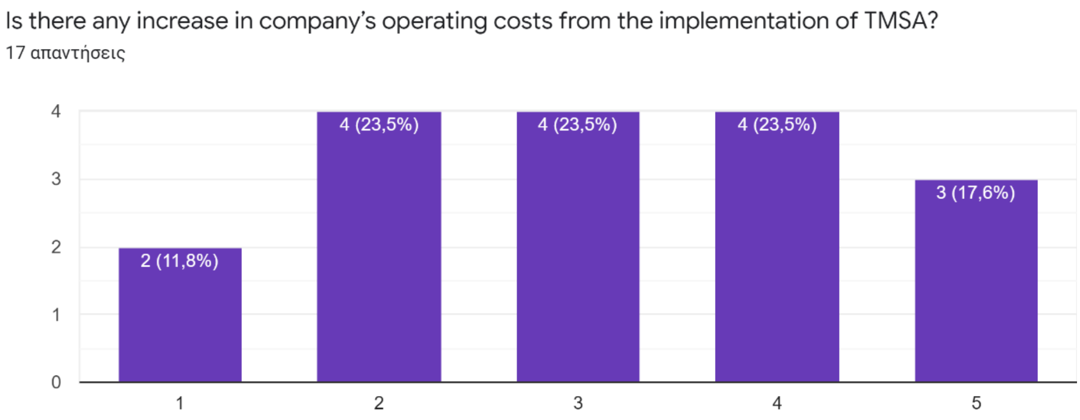

Figure 15: Is there any increase in company's operating costs from the implementation of TMSA?

Participants believe that there is an increase in operating costs from the implementation of TMSA. However, there is a range of answers for this issue. It is concluded that the participants do not consider the implementation of TMSA as a costless procedure for a shipping company. For question 5, there was a great range of answers from the grade 1 to grade 5. A clear conclusion should not be drawn, as some of the participants believe that the appropriate training and direction to implement TMSA were received, while other participants believe that the received training was not adequate enough to be prepared for the implementation. These details are shown in the below figure:

Figure 16: Have you received the appropriate training, empowerment of your skills according to TMSA criteria?

For question 6 ‘Do you consider that the results of TMSA have an impact to the charterer’s decisions and/or the shipping market in general?’, the extreme majority of the participants believe that the outcome of the TMSA is vital for the charterers and the shipping market. They believe at a percentage of 47.1% that all the stakeholders take into consideration the results of TMSA procedure, before they make a decision to enhance or not their relations with this company. The below figure shows these conclusions:

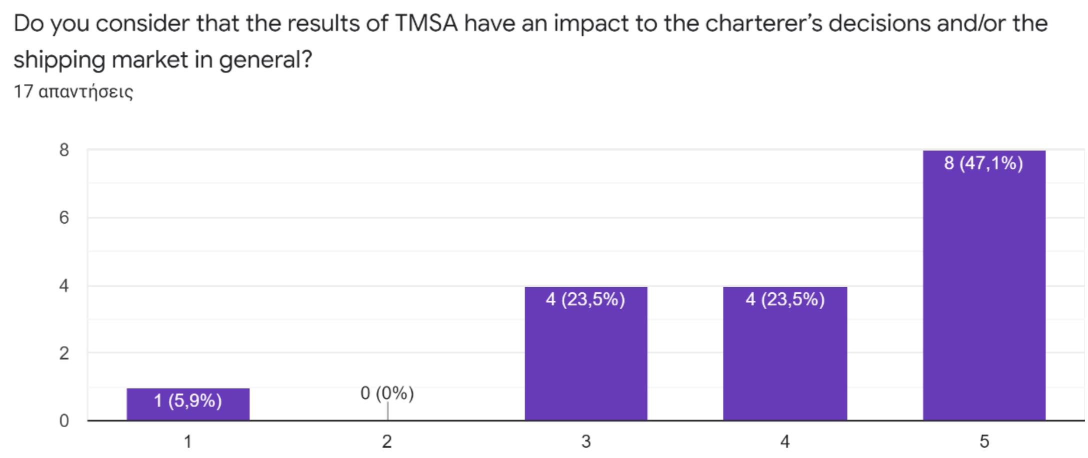

Figure 17: Do you consider that the results of TMSA have an impact to the charterer’s decisions and/or the shipping market in general?

For question 7 ‘Are changes and the new edition of TMSA 3 sufficient for the estimation of the shipping company’s risk?’, the majority of the participants responded that the changes occurred due to the new edition of TMSA, are not sufficient for the estimation of the risk. The new edition is probably considered as a tool that is developed to the right direction for risk estimation, however most of the shipping industry’s executives believe that additional measures must be taken for the effective estimation and risk hedging. Although the edition 3 of TMSA made changes, faced problems and covered gaps that were not covered by previous editions, there are probably more changes to be included in a future edition of TMSA that will be published. These conclusions are drawn from the below figure, where the majority of participants (47.1 %) believes that TMSA is not sufficient for the estimation of the risk.

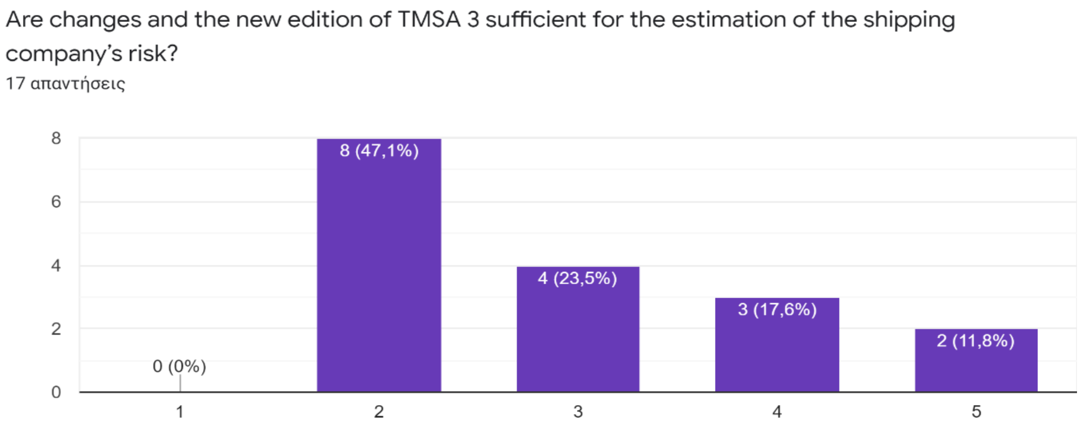

Figure 18: Are changes and the new edition of TMSA 3 sufficient for the estimation of the shipping company's risk?

With question 8 'Which TMSA element is considered the most significant from the aspect of external stakeholders?', we tried to identify which TMSA element is highly important for external stakeholders, like charterers, local authorities, investors, bunker traders, society etc. We received a range of answers for this question, the same as both in questions 1 & 2, for which there is also a range of answers from the participants. Most of the participants consider that element 10, which is related with environmental and energy management, is highly significant especially for the society and the local authorities. In a period that the decarbonization of vessels' bunkers and the use of alternative, more eco-friendly bunkers, is an issue of high importance for the shipping companies, the establishment of a highly motivated social profile, through the adoption and implementation of all the necessary environmental changes, is vital for a shipping company. Consequently, for this reason the majority of the participants may consider too significant the element 11 from the aspect of external stakeholders, as depicted in the below figure. Furthermore, participants believe that after the element 11, the element 6 is significant too, which is related with the daily vessel's operations.

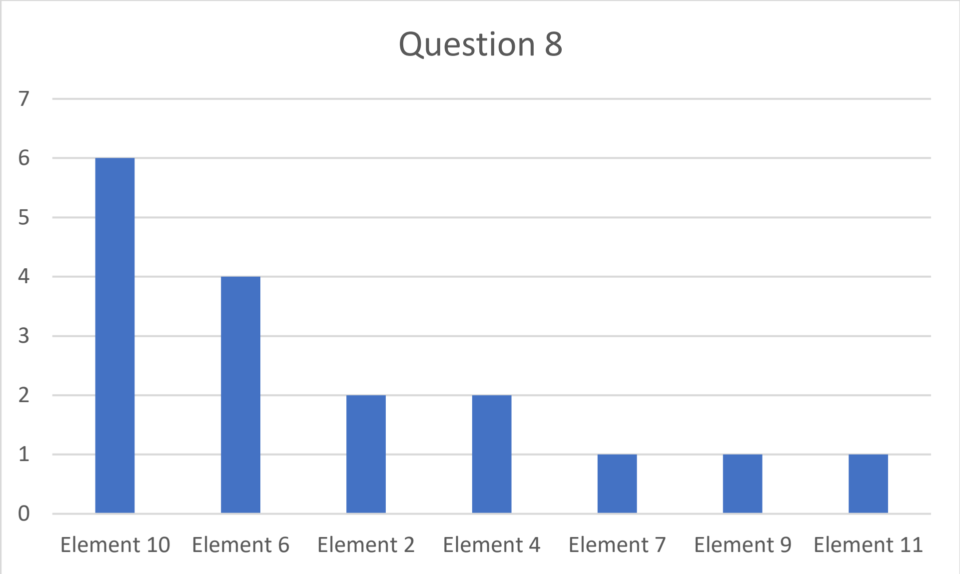

Figure 19: Which TMSA element is considered the most significant from the aspect of external stakeholders?

Finally, with questions 9 & 10 we tried to estimate how efficiently TMSA elements are implemented from onshore and vessel's personnel. We noticed from the answers, that the participants consider the onshore personnel more prepared, educated, and efficient at implementation of TMSA than the vessel's personnel. This conclusion is drawn probably from the fact that there is a gap between the knowledge and training that onshore personnel receive, and knowledge and training that vessel's personnel receive. Moreover, vessel's personnel may have lack of experience or appropriate knowledge for the implementation of TMSA. The above trends in participants' opinion are explained by the below figures, where more of the 58.8% of the participants believe that the onshore personnel implement effectively TMSA and more of the 40% of the participants believe that the vessel's personnel do not implement effectively TMSA:

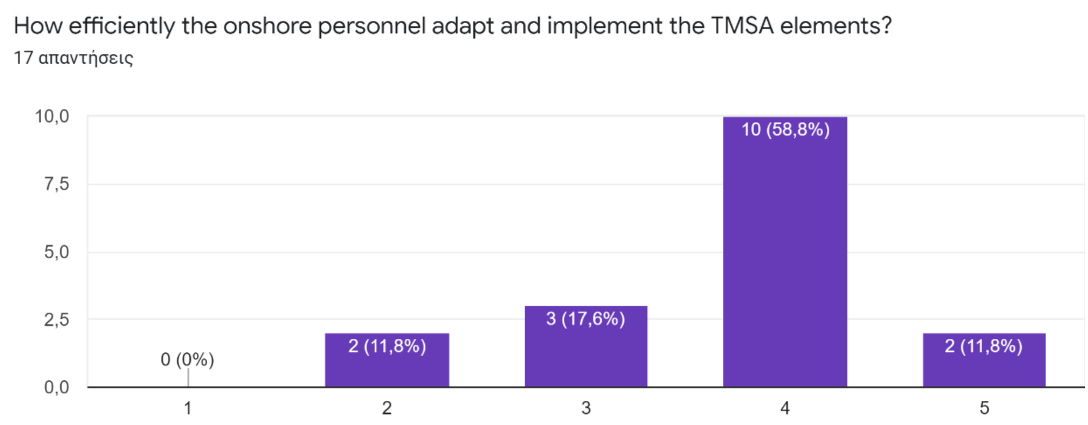

Figure 20: How efficiently the onshore personnel adapt and implement the TMSA elements?

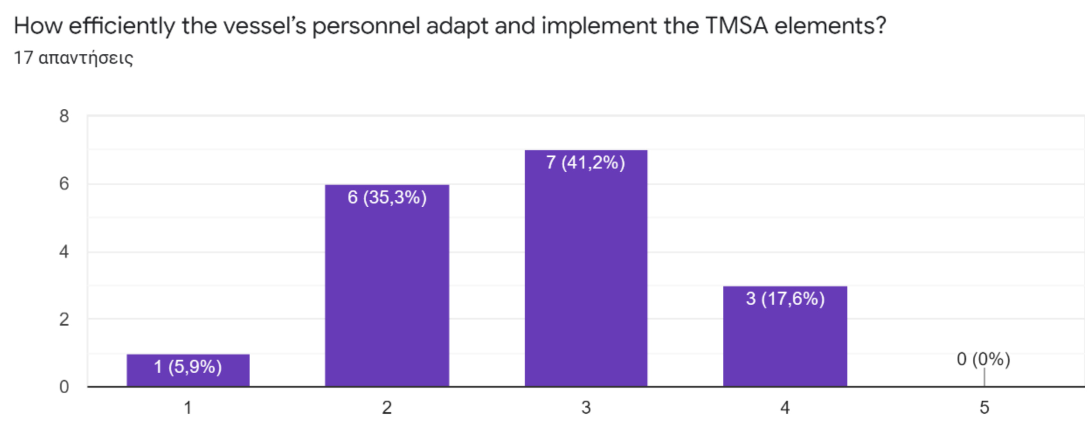

Figure 21: How efficiently the vessel's personnel adapt and implement the TMSA elements?

1.10.3 CALCULATION OF TMSA

TMSA elements are consisted of 266 KPIs (according to the third edition published on 2017). However, some of these KPIs can be calculated through specific formulas, as they considered as arithmetic values. There are many KPIs which are not considered as arithmetic values and therefore, cannot be estimated through arithmetic formulas. Element 1.2.1 is an example of these KPIs, which defines the level of HSSE excellence and the level that is satisfied is not evaluated through a formula. This KPI is a dummy variable and estimation of the level will be completed through analysis, comments, and conclusions. The Best Practice

Guidance is also used and contributes to the estimation of the level that these KPIs (like the element 1.2.1) are satisfied. For arithmetic KPIs, a Value variable is estimated. For example, element 2.3.2 determines the number of shore-based personnel that is required for the effective implementation of SMS. This number is affected by several factors like, the change in the size of the fleet, changes in the legislation, introduction of new shipping designs etc. Another example is element 4.3.3, which evaluates the fleet reliability through performance indicators measurement. We may define as a performance indicator the number of failures of critical equipment, which is symbolized with *KPI Value*. KPIs takes a value from range between 0 and 100. KPI Rating is calculated according to the below formula:

$$\text{KPI Rating} = 100 \times \frac{\text{KPI Value} - \text{KPI MinReq}}{\text{KPI Target} - \text{KPI MinReq}}$$

KPI MinReq is the value that should be the lowest value between the range of 0-100. Therefore, KPI MinReq is equal to 1. However, KPI Target should be estimated with the maximum value from the range of 0 – 100 and its value is equal to 0. Further to the above assumptions, if we assume that the KPI Value is equal to 1 then KPI Rating should be equal to 0 or 0%:

$$\text{KPI Rating} = 100 \times \frac{1-1}{0-1} = 0$$

Another example for the measurement of TMSA may be considered the element 1.3.1, which is referred to the establishment of targets related to HSSE performance. In this element KPI Value may be considered the number of personnel injuries, the number of pollution incidents etc. KPI MinReq is equal to 1 and KPI Target is set equal to 0. Further to the above assumptions, if we assume that the KPI Value is equal to 1 then KPI Rating should be equal to 0 or 0%:

$$\text{KPI Rating} = 100 \times \frac{1-1}{0-1} = 0$$

In many TMSA elements the idea of retention ratio is referred and used for the measurement of KPIs. Some examples are the elements 2.2.2, 2.3.3, 3A.2.A & 3A.3.4., where the retention rate is used. This rate is defined as below:

$$\text{Retention Rate} = 100 - \frac{\{S - (UT + BT)\}}{AE} \times 100$$

Variable S is equal to the number of employees that have terminated their cooperation with the shipping company, variable UT is equal to personnel's retirements or termination of employment due to long term sickness. BT is equal to the less efficient employees who decided to leave the company and AE is the average number of employees working for the company, calculated for a period of 12 months.

CHAPTER 2: VETTING

(Edited by Vasiliki Linardou)

2.1 VETTING INSPECTION

Vetting inspection is an assessment carried out on a vessel by a trained inspector who tests whether the vessels enforces international safety standards and takes pollution prevention measures. This will enable a potential charterer to choose easier the right vessel to carry their cargo. The suitability of the vessel is assessed by multiple factors such as the equipment maintenance, the training and preparation of the crew, the available emergency plans etc.

2.2 HISTORY

Historically the traditional owners of tankers fleet were the big oil companies and long-term time charters were becoming increasingly rare with the spot charter market becoming very active. Around 1970, the use of petroleum and its refined products were becoming very popular at a global level for fuel use and electricity power replacing coal and wood. This change in the energy sector led to an increase in sea transportation of oil products and its refines (gasoline, diesel) who became very popular in automotive and ship industry. With the global demand of oil it is observed that independent ship owners were increased rapidly in oil industry which was until then dominated by oil companies. The problem with this change is that independent ship owners who wanted to profit from this new economic reality have neither previous experience in shipping nor real interest. Even with small tanker fleet ship managers were gradually gaining influence. This change raised the issue of the quality of the growing tanker fleet as numerous of oil spills occurred from 1970 onwards. It is when the OCIMF organization was created and developed a vetting plan unique for each company. OCIMF published inspection questionnaires for tankers carrying petroleum and oil products based on IMO international conventions of SOLAS and MARPOL. Soon OCIMF realized that a change was also necessary in the shore-based ship management. Sometimes oil spill accident can easily occur because of poor communication with the company's offices or because of wrong guidelines from the office. For this reason, OCIMF started to assess the operators, the ship agencies and companies' management plans. The aim of the vetting inspection is to assess whether the shipping companies implement international legislation in their operation plan and if they meet certain industrial standards.

2.3 OIL SPILL ACCIDENTS

2.3.1 THE AMOCO CADIZ OIL SPILL (1978)

Figure 22: Amoco Caldiz oil spill (Mehnazd, 2019)

On March 16, 1978, the VLCC Amoco Cadiz was traveling from the Persian Gulf to Europe carrying large quantity of crude oil more than 220.000 tons. Due to the extreme weather conditions multiple waves hit the vessel and pushed it near the shore line toward the Breton Coast. In the end the Liberian flag VLCC hit a rock close to the Portsall Port close to north France. The vessel ended to break in 3 pieces causing the largest oil spill in history. 220.000 tons of crude oil and 4,000 tons of fuel released close to the coast of Brittany in France resulting the largest loss of marine life ever. The cause of accident was “grave negligence” according to the French Prime minister who later banned all tanker vessels to approach the French coast in a distance closer to 11 meters. (Safety 4 Sea, 2019).

2.3.2 SANTA BARBARA OIL SPIL

On January 1969 another ecological marine disaster occurred in US waters. 3 million gallons of crude oil were released in ocean waters in the coast of Santa Barbara of California. The oil spill occurred in Platform A, 6 miles close to the coast, which was exploded after oil and gas pressure. The implications in marine life were enormous. After the explosion an enormous are of 35 miles from coast was covered by oil and as a result thousands sea animals died and is marked as one of the worst environment disasters in US.

Figure 23: Santa Barbara oil spill changed oil and gas explotation forever (Mai-Duc, 2015)

2.3.3 EXXON VALDEZ OIL SPIL

It was the worst oil spill in US history until the Exxon Valdez happened 20 years later. The Exxon Valdez oil spill occurred in 1989. The oil tanker Exxon Valdez owned by the shipping Company Exxon Mobile spilled 1 million gallons of crude oil in Alaska Prince William Sound. Again, the ecological disaster was enormous. The oil slick covered 1,300 miles of coast line and killed thousands of sea birds, otters, seals and whales

Figure 24: Juneau Empire Opinion: thirty years since the Exxon Valdez spill and our current ship of state

2.4 OIL COMPANIES INTERNATIONAL MARINE FORUM (OCIMF)

OCIMF

The Oil Company International Marine Forum was founded in 1970 as a reaction to the global fear about sea pollution from oil industry. Today OCIMF has a leading role in maintaining safety of sea and consultancy status at the IMO. The mission of OCIMF is to create a human and environmentally friendly marine industry. (OCIMF, 2021) Thus the aim of OCIMF is to propose guidelines in construction of the vessels and operation of tankers, barges and offshore vessels. OCIMF use the expertise of its members-Submitted Companies and external partners in order to develop several publications and programs to ameliorate safety in operations and environmental protection. Furthermore, OCIMF offers a number of inspection tools to vessel operators in order to implement safety measures.

Ship Inspection Report Program (SIRE)

Offshore Vessel Inspection Database (OVID)

Tanker Management Self-Assessment (TMSA)

Marine Terminal Information System (MTIS)

Barge Inspection Report Program (BIRP)

SIRE 2.0

2.5 OCIMF PROGRAMMES REQUIREMENTS FOR SUBMITTING COMPANY

A Submitting Company is considered a company approved by OCIMF to commission inspections and is able to submit inspections reports with their own name into an OCIMF program database. OCIMF programs are

- Ship Inspection Report Program (SIRE)
- Barge Inspection Report Program (BIRE)
- Offshore Vessel Inspection Database (OVID)

The OCIMF set out some minimum criteria for a company to be considered as a Submitting Company in SIRE BIRE and OVID. The criteria for a Submitting Company are divided in 3 categories.

1. Eligibility Criteria
2. Agreement with the OCIMF Code of Conduct and Terms & Conditions
3. Probationary Period and requirements for retaining Submitting Company Status.

One of the requirements for becoming a Submitting Company is the candidate must be:

SIRE: a company that charters tankers or operated oil marine terminals such as crude oil, oil products but also chemicals and petrochemicals or gas and holds risk and title of crude oil, condensate refined petroleum products, chemicals, petrochemicals, and by products, bio fuels, gas or fuel cargoes carried on vessels chartered or commercially managed by the applicant.

BIRE: a company that charters barges, tugs or units or operates an oil marine terminal crude oil, oil products, petrochemicals or gas.

OVID: a company that charters offshore vessels and is registered as the Duty Holder of an offshore concession.

One of the aims of OCIMF inspection programs is to prevent the number of repeat vessel inspections in the industry. Thus, the role of the OCIMF Quality Assurance team is to monitor and assess the activity of each Submitting Company in the program. This is to ensure that inspections commissioned by a Submitting Company are aligned with their business or marine assurance needs.

Below are some indicative criteria for a Company to be considered as a Submitting Company.

Part1 Eligibility Criteria

Criteria 1. The applicant can't be one of the following entities or acting as a consultant to an affiliate or third party:

- P&I Club
- Insurance Company
- Third Party Vetting Company
- Independent Consultancy
- Academic or Research Institution
- Classification Society
- Media Organization
- Industry Non-Government Organization or other industry Association
- Entity only engaged in commercial chartering and commercial management of vessels

Criteria 2. The Applicant must prove that matches within the relevant criteria for SIRE, BIRE or OVID:

- SIRE

The applicant must be:

- An established SIRE Program Recipient for at least 12 months at the time of their application.

- A company that charters tankers and/or operates an oil marine terminal crude oil, oil products, chemicals, petrochemicals or gas.

- BIRE

-An established BIRE or European Barge Inspection System (EBIS) Program Recipient for at least 6 months.

- A company chartering Barges, Tugs or Units and / or operates an oil marine terminal.

- OVID

The applicant must be:

- An established OVID Program Recipient.

- A company chartering Offshore Vessels.

- A company that is designated or registered as the Duty Holder of an offshore concession or responsible to assume the role of Duty Holder of an offshore concession.

<u>Part2. Agreement with the OCIMF Code of Conduct and Terms & Conditions</u>

The applicant should meet all the criteria in Part 1 and must be approved by the Programs Committee. The Applicant must agree to the OCIMF Code of Conduct, Programs End User License Agreement (EULA), and OCIMF Submitting Company Terms and Conditions.

<u>Part 3. Probationary Period and Requirements for Retaining Submitting Company Status</u>

For a minimum period of 2 years the New Submitting Companies must complete a probationary period. OCIMF has the right to take one or more of the following measures if during the probationary period a non-compliance action is suspected:

- Call an immediate OCIMF Verification Meeting.
- Initiate a formal inquiry.

- Start a formal inquiry and gather a review panel
- End the probationary period and purge all the report submissions rights.

At the end of the probation period OCIMF will take on of the following actions:

- Confirm the Submitting Company Status
- Extend the Probationary Period
- Not confirm the status of Submitting Company and end all report submissions rights.

2.6 SIRE INSPECTION

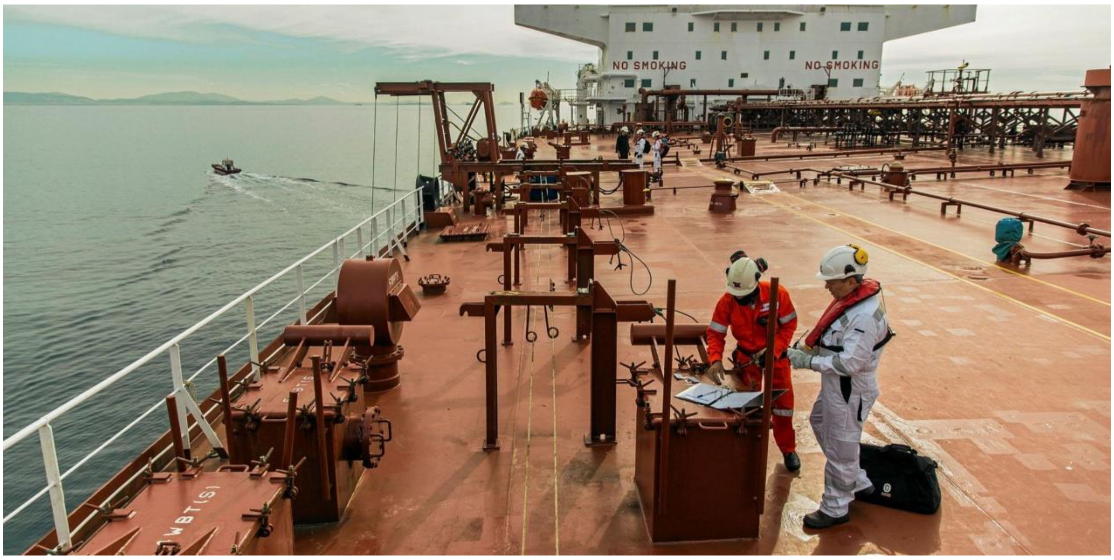

Figure 25: TradeWinds: OCIMF give remote vetting guidelines to SIRE inspectors

Ship inspection report program or SIRE is one of the first tanker risk assessment tool developed by OCIMF in 1993 in order to address the issue of poor safety shipping. The SIRE questionnaire is a great tool to measure the risk for vessels carrying oil, gas and chemicals and brings and is of primary importance to charterers, ship operators, terminal operators and government bodies concern with ship safety. The Questionnaire of SIRE includes a large database with updated data about tankers and barges. The program is widely welcomed by the shipping industry since nearly 180,000 inspections have been reported to SIRE. On average more than 8000 reports per month conducted from the Program Recipients. (OCIMF, 2019).

The participants of the SIRE questionnaire have to complete a uniform inspection protocol that is measured by the following:

- VIQ – Questionnaire for Vessel Inspection
- BIQ – Questionnaire for Burges Inspection
- Uniform SIRE Inspection Report
- VPQ – Questionnaire regarding Vessels Particulars
- BPQ – Questionnaire regarding Barge Particulars

“SIRE program has become an important source where the charterers can have access to technical and operational information. The increasing use of SIRE aligns with the big effort of oil industry to control whether vessels are properly operated and maintained. After the Inspection, reports are saved for nearly 12 months from the date of conclusion and are maintained on the database for 2 years. The reports are available to OCIMF members and the external stake holders such as oil terminal operators and port authorities but also charterers and governmental bodies.

The Revisions of SIRE program

The SIRE program was firstly revised in 1997 and introduced the means whereby the users of the program could receive reports and any operator comments electronically.

The SIRE program was revised again in 2000, 2004, 2013. 7th and latest edition was published on February 22, 2019. (OCIMF, 2019).

How it works?

OCIMF member companies conduct vessel inspections and hire a trained SIRE inspector to conduct the audit. Inspector takes access to the ship’s information from the online database of SIRE and from Vessel/Barge Inspection Questionnaires (VIQ/BIQ). The inspection procedure includes firstly an on-board inspection of operation procedures such as how the cargo is handling by the crew and what is the pollution prevention action plan of the ship.

SIRE program is a great tool and has offered a great evolution in tanker industry.

- It reduced the incidents at sea through the strict operation standards.
- It established high quality standards and elevated the education for ship inspectors.
- Reduced the problem or multiple inspections in the same ship.

Uniform Vessel inspection Procedure

The OCIMF SIRE Program suggests that participating companies to undertake a Uniform Vessel Inspection Procedure. The uniform procedure contains 2 parts: the Inspection Element and a Report Element. The Inspection Element the inspector uses a number of detailed questionnaires unique for each type of the inspected ship. The questionnaire focuses on practices regarding safety and pollution prevention. The inspector who is employed by the participating company must answer all the questions. The Report Element is conducted by the inspector once the electronic questionnaire is submitted.

2.7 VESSEL INSPECTION QUESTIONNAIRE

As it is already mentioned the VIQ is used to assess the safety management plan of the vessel as well as measures to prevent a marine pollution. Questions of the VIQ are unique to the type of the inspected ship. The questionnaire is divided in 12 chapters. Each chapter inspects different areas of safety management plans and pratiques for pollution prevention using different questions The Inspector must fill the questionnaire with the following answers: Yes, No, Not Seen, Not Applicable In Section 4 the SIRE includes the "Mandatory Inspection Requirements" that inspectors must follow during the onboard inspection. For example, the inspector must introduce himself to the Master, and highlight the aim and the importance of the inspection.

The inspection questionnaires used in SIRE program includes a series of questions about safety and pollution prevention applicable to the type of vessel that is inspected. These questions are numbered and grouped into separate chapters. Each chapter contains a series of questions to be answered by the inspector. It explains the scope of the inspection and agree the preferred order in which it will be carried out prior to commencement of the inspection. (OCIMF, 2019)

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Figure 26: Ship Inspection Report (SIRE) Programme (VIQ7) (OCIMF, 2019)

The above listed requirements are summarised below.

Box	Option	Response
Y	Yes	Tick **"Yes"** if, in the inspector's professional judgement assisted by the guidance (if provided), a positive response can be made to the question. If, in the inspector's judgement the Yes response requires to be amplified with further positive comments, the inspector may record such comments in the Comments box. Inspectors should keep in mind, that unless an unusual situation needs to be positively described, then a **"Yes"** response without comment is adequate.
N	No	Tick "**No**" if, in the inspector's professional judgement assisted by the guidance (if provided), a negative response should be made to the question.
NS	Not Seen	Tick "**Not Seen**" if the issue addressed by a question has not been seen or checked by the inspector. The reason why the topic or issue was not seen must be recorded in the Observations box.
NA	Not Applicable	Tick "**Not Applicable**" if the subject matter covered by the question is not applicable to the vessel being inspected. In some cases, the **"Not Applicable"** response is made automatically within the software and is subject to the type of vessel being inspected. In other cases, a "**Not Applicable**" response is not provided to the question and only the "**Yes**", "**No**" or "**Not Seen**" response options are available. If, in the inspector's judgement the **"Not Applicable"** response requires to be amplified with further comments, the inspector may record such comments in the Comments box. If, in the inspector's judgment an explanatory comment is necessary, the inspector may make such comment in the **"Comments"** section accompanying the question provided such comment makes amplification to assist the understanding of a report recipient as to an issue associated with a specific question.
	Observations and Comments	An Observation by the inspector is required for a "**No**" or "**Not Seen**" response. Where the question specifically calls for inspector comment irrespective of how the response box is checked, such comments are required to be recorded in the **"Comments"** section that accompanies the question. Inspectors are free to record comments even where a box is checked "**Yes**" provided such comment makes amplification to assist the understanding of a report recipient as to an issue associated with a specific question.
	Additional Comments	The **Additional Comments** section at the end of each chapter may be used to record comments in respect of the chapter that are ***additional*** to those which the inspector may make when responding to the specific questions.

Figure 27: Shipe Inspection Report (SIRE) Program.

The SIRE VIQ is divided in 12 Chapters:

Chapter 1 General Information

Chapter 1 includes general information regarding the vessel that is inspected and indicate the ID of the vessel.

- Responsible person: the Master

In General information among others the following are included:

- Name of the vessel
- Vessel IMO number

- Date the inspection was completed
- What is the name of the inspected port?
- Flag/ Nationality
- Vessel type
- Hull type
- Name of Classification Society

Chapter 2 Certification and Documentation

In Chapter 2 of SIRE VIQ are inspected the documents a vessel should have onboard such as documents regarding safety measures, operation procedures manuals, Antipollution measures and documents regarding structural concerns.

- Responsible person: the Master

Some certificates that are inspected are the following:

- International Compliance certificate
- Certificates proving the ship has a safety management scheme
- A certificate proving the ship uses safe equipment
- Ballast Water Management Certificate
- Maritime Labor Convention (2006)
- Civil Liability Convention Certificate
- Minimum Safe Manning Document
- Safety Construction Certificate
- Certificate of Registry

Chapter 3 Crew Management

Chapter 3 of SIRE VIQ is all about the crew of the inspected ship. The inspector will answer questions regarding the crew management, crew qualifications and measures regarding drug and alcohol policy. The crew officers should be able to communicate in the same language. Crew officers should carry as well certificated that proof they are trained for the cargo they are transferring.

- Responsible person: the Master

Chapter 4 Navigation and Communication

Chapter 4 of the SIRE VIQ is all about navigation procedures and activities. In order to prevent marine accidents and to ensure the safety of the cargo in this section it is essential for the inspector to measure the optimal efficiency of the navigation equipment. Navigation equipment such as radars, electronic charts and GPS should be maintained in excellence conditions. This section of VIQ also tests if the required procedures regarding navigation are followed, such as maintaining records during embarkation and disembarkation in port the times and position when passing waypoints weather and sea conditions. In addition, equipment used for navigation should be in a good condition.

- Responsible person: the Master & Navigator officer

Chapter 5 Safety Management

In Chapter 5, inspector assess whether the officers are familiar with the process for conducting Risk Assessment and safety management plans. It is also tested if the crew officers are familiar with the equipment used for emergency situations. In this chapter it also inspected the process of recording all accidents and incidents and non-conformities that are generated on the ship and that are properly reported in shore office. Crew members should always wear protective clothes such as suits and boots during the operations. Chapter 5 includes:

- Risk assessments → Responsible person: all on board
- Drill Training and familiarization → Responsible person: Safety Officer
- Ship Security→ Responsible officer: Safety Officer
- Enclosed space and Pump Room Entry Procedures → Responsible Person: Chief Officer
- Permits to work: Hot and Cold Work, Enclosed Space Entry, Working Overboard, Working at Height etc. → Responsible Person: Chief Engineer/ Chief Officer/ Safety Officer
- Monitoring of non-cargo spaces → Chief Officer
- Gas Analyzing Equipment → Chief Officer
- Hot Work Procedures → Chief Engineers
- Life Saving Equipment → Safety Officer
- Fire Fighting Equipment → Chief Engineer & Safety Officer

- Material Safety Data Sheets (MSDS) → Chief Officer
- Vessel's Access → Chief Officer

Chapter 6 Pollution Prevention

The chapter 6 of VIQ is related with the pollution prevention plan and practices that the crew needs to be aware of. In particular chapter 6 includes instructions regarding cargo handling during charging and discharging how to prevent pollution onboard and how the ballast water should be handled. Chapter 6 includes:

- Oil Record Books→ Person in charge: Chief Engineer and Chief Officer
- Cargo Record Book→ Person in charge: Chief Officer
- All Shipboard Oil and Marine Pollution Emergency Plans including Vessel Response Plan (OPA 90) if required →Person in charge: Master
- Cargo Operations and Deck Area Pollution Prevention → Chief Officer
- Pump rooms and Oil Discharge Monitors → Chief officer
- Ballast Water Management→ Chief and Second Engineers
- Garbage Management → Master and Chief officer
- Vessel and General Permit → Master & Chief Officer

Energy Efficiency Management Plan → Master & Chief Officer

Chapter 7 Maritime Security

Chapter 7 of VIQ is related the ship Security Plan and responsibilities of security officers. In this chapter inspector assess the function of security communication equipment, the passage plan, the voyage security risk assessment plan and cyber security plans.

- Person in Charge Master or Chief Officer

Chapter 8 Cargo and Ballast Management

The Chapter 8 of VIQ includes Cargo Ballast System for Petroleum products, for Chemical products, LPG and LNG. This Chapter includes questions regarding practices for safe carriage and handling of petroleum products according to international safety standards (ISGOTT). According to this chapter inspectors are responsible to monitor cargo operations and interview the responsible officers. Inspectors will examine the stability and cargo loading limitations, cargo operations procedures during loading and unloading of oil products and safety management, vetting arrangements, methods of washing crude oil cargo, safety measures for static electricity and procedures to prevent pollution to offshore installation. Chapter 8 includes:

- Policies, Procedures and documentation → Person in charge Chief Officer
- Stability and Cargo Loading limitations → Chief officer
- Cargo Operations and Related Safety Management → Chief Officer
- Venting Operations → Chief Officer
- Vessel Emission Control System → Chief Officer
- Intert Gas System → Chief Engineer and Chief Officer
- Crude Oil Washing → Chief Officer
- Static Electricity Precautions → Chief Officer
- Manifold Arrangements → Chief Officer
- Pump Rooms → Chief Officer
- Pressure Testing of Cargo Hoses (if applicable) → Chief Officer
- Cargo Lifting Equipment → Chief Officer
- Ship to Ship Transfer Operations – Petroleum →Chief Officer

Chapter 9 Mooring

Chapter 9 of VIQ concerns the Mooring equipment documentation and management. In this chapter the inspector examines if the vessel has developed a mooring system management plan and if it is equipped properly for the mooring procedure. A common cause of accidents in port is the insufficient knowledge of mooring process. Thus poor quality equipment, unattended mooring lines or poor attention to weather condition can easily lead to a serious accident. Chapter 9 includes:

- Mooring Equipment Documentation → Person in charge: Master
- Mooring Procedures → Person in charge: Chief Officer
- Mooring Equipment → Chief Officer
- Anchoring Equipment → Chief Officer
- Single Point Mooring → Master
- Emergency Towing Arrangements → Chief Officer

Chapter 10 Engine and Steering Compartments

In Chapter 10 of VIQ it is examined weather the engineers are familiar for safe operation of the machinery plant. The engineer staff should be able should have full knowledge of the essential emergency equipment and a detailed plan should be written in the engine room and must be written for the specific ship. In addition, this chapter examines procedures regarding the bunkering process and gives specific guidelines: the personnel responsible for fuel charging on board during bunkering operation, should have no other duties and are required to stay at their working station during the whole process. Chapter 10 includes:

- Policies Procedures and Documentation → Chief Engineer
- Planned Maintenance → Chief Engineer
- Safety Management → Chief Engineer/ Second Engineer
- Machinery Status → Chief Engineer/ Second Engineer
- Steering compartment → Chief Engineer/ Second Engineer
- Chemicals Material Safety Data Sheets → Chief Engineer/ Second Engineer

Chapter 11 General Appearance and Condition

In chapter 11 of the VIQ it is examined whether the vessel equipment in general is maintained in good condition externally and internally. For example, in this chapter it is highlighted that the hull of the vessel should be properly cleaned and be free of stains in case of accidents or oil discharge. In addition, the electrical equipment should function sufficiently to illuminate the deck and facilitate working during night time. In the internal space the inspector will examine whether the accommodation area, public spaces, food stores, hospital, are properly cleaned and tidy. Chapter 11 includes:

- Hull, Superstructure and External Weather Decks → Responsible Person Master/ Chief Engineer
- Electrical Equipment → Chief Engineer
- Internal Spaces → Chief Officer
- Accommodation Areas → Chief Officer

Chapter 12 Ice Operations

In Chapter 12 of VIQ it is examined whether the vessel has an available manual on how to operate in ice or Polar Waters in order to avoid accidents in ice waters. Ships should be well equipped to protect the working personnel from the extreme cold temperatures such as protecting clothes. Ships that do international voyages in Polar waters are required to comply with the Polar Code (2017). In this chapter it is specified that “Severe sub-zero Conditions” are defined weather temperatures below -15C.

2.8 INSPECTION PROCESS

The first impression counts, so it is important when the inspector is on board that he gains a positive impression of the vessel. The visual inspection begins exactly the time the inspector sees and approaches the vessel. Therefore, it is important to do the following preparations:

- The gangway ladder should be placed safely and correctly
- Gangway warning sign for visitors should be posted and be visible from shore
- The gangway watchman is properly dressed in correct personal protective equipment.
- The inspector is greeted with respect and requested for identification.
- The gangway watchman can start security checks, safety briefing, and ensure the inspector’s mobile telephone is switched off.
- The inspector will announce the purpose, route and duration of the inspection
- Inspector will suggest what items of equipment will need to be demonstrated in their presence i.e., lifeboat engine, emergency generator, bilge separator and oil mist detector alarms etc.

The documents below should be made available at any time for the inspector’s arrival. Not all these documents apply to all tanker ships. However, it is very important to have all papers available to speed up the inspection. (INTERTANKO, 2015)

- An updated Harmonized Vessel Particulars Questionnaire (HVPQ)
- The Operator’s full style and contacts.
- Continuous Synopsis Record (CSR) and attached forms
- Document of Compliance
- Safety Management Certificate
- International Ship Security Certificate
- All the vessel’s Class Certificates filed in the same order as displayed in the VIQ. Some Port Authorities will need to see the original class certificates in

their office. Therefore, it is strongly recommended that all class certificated are photocopied and available in the absence of the originals.

- International Tonnage Certificate
- Minimum Safe Manning Certificate
- Certificate of Fitness
- Noxious Liquid Substances Certificate
- Civil Liability Convention (1992) Certificate
- P and I Club Certificate of Entry
- US Certificate of Financial Responsibility
- Lifesaving and fire-fighting servicing certificates, including lifeboats on-load release mechanism
- Port State Control inspection report file and evidence of close out of any deficiencies.
- Lifting gear register
- The Operator’s ISM/SMS manuals
- Records of Operator’s representative visits to the vessel including those by the Senior Management of the company.
- Latest Operator’s audit report and non-conformity close out evidence.
- Reports and correspondence of the Master’s review of the safety management system.
- Latest Class Survey Status report (less than 4 months old)
- Class survey reports (annual, intermediate special and occasional)
- Records of cargo and ballast tanks void spaces, trunks and cofferdams.
- Ship Energy Efficiency Management Plan.
- Enhanced Survey Reports
- Executive Hull Summary
- Condition Assessment Scheme
- Condition Assessment Program
- Thickness measurement report
- Garbage log book
- Oil record book Part 1
- Oil Record book Part 2
- Cargo record book
- Vessel’s Response Plans applicable to the vessel as follows:

  - Vessel Response Plan with OPA 90
  - Shipboard Oil Pollution emergency Plan (SOPEP)
  - Shipboard Marine Pollution Emergency Plan
  - Panama Canal Shipboard Oil Pollution Emergency Plan
  - California Vessel Response Plan
  - Washington State Response Plan

- Operator’s Drug and Alcohol Policy
- Intert Gas System Manual
- Trim and Stability Manual – approved by vessel’s class
- Damage Stability Manual – approved by vessel’s class
- Loading Computer Manual – approved by vessel’s class
- Oil Discharge Monitoring Equipment Manual – approved by vessel’s class
- Crude Oil Washing Manual – approved by the vessel’s class
- Water Ballast Management Plant – approved by vessel’s class
- Procedures and Arrangements manual approved by vessel’s class
- Certificates of fire-fighting equipment servicing
- Certificates of lifesaving equipment servicing
- Certificate of mooring lines, shackles and tails certificates, that clearly identifies the winch drums they are each fitted to.
- Certificates of emergency towing-off wires
- Record of mooring winches Brake Holding Capacity test records
- Bow chain stopper SWL certification
- Hours of work/tests records
- Crew list
- The online officer’s matrix must be filled accurately and correctly.

<u>The Officer Matrix</u>

It is of primary importance that the Officer’s Matrix must be extremely accurate. It is critical to ensure that the ship’s complement are following the different crew matrix requirements of individual oil and chemical companies. Officer’s Matrix should include the following elements:

1. Rank of the officer

2. The Nationality of the officer
3. Certificate of Competency. This should be the highest level of competency the officer holds.
4. The issuing country of the officer’s license that may not necessarily be the same nationality as the officer.
5. The officer’s license must be acceptable to the vessel’s Flag State Administration.
6. The officer must have tanker training relative to the type of tanker they are currently serving on.
7. The STCW V paragraph is referring to specialized tanker training provided to junior officers and ratings who have responsibilities during cargo operations (Chapter V paragraph 1.1). Chapter V paragraph 1.2 refers to specialized tanker training applicable to those officers responsible for cargo transfer operations.
8. Radio Qualification
9. The number of whole calendar years the officer has been employed by the vessel’s management company.
10. Years in Rank - “actual years of sea service” sailed in the current rank
11. Years on this type of tanker – “actual years of sea service” served on all tanker types of oil and chemical and gas
12. The number of months on board since joining this current vessel

Is at the discretion of operators to add an additional element in their company’s officer’s matrix to include “the actual years of service” as an officer of the watch (OOW). This can be very helpful as some vetting departments will choose to evaluate the junior’s officers’ experience level in addition to the senior offices.

13. Months of experience as OOW. No matter what rank this is combined total of “actual months of sea service” served as an OOW”. For example, for the chief Officer’s sea service as a watch keeping officer is the total as Chief 2nd and 3rd officer. Similarly for the 2nd officer a combined total as 2nd and 3rd officer. Also, this applies to the Engineers, the “actual months sea service” as a watch keeping Engineer Officer. For example, for the 2nd engineer is the total sea service as a 2nd, 3rd and 4th engineer and 3rd engineer a combined total as a 3rd and 4th engineer.

The reasoning behind adding this extra line to the Officer's Matrix is for example, the 2nd Officer may have just two months' actual sea service in rank but as a 3rd officer may have has 24 months. Therefore, instead of having what initially looks like two months experience in rank the officer actually has a combined total of 26 months of sea time as a watch keeping officer. There are charterers that will assess negatively if there are too many newly promoted officers at the same period on board and they will examine the officers' experience and history as OOW. Members are advised that if the vessel is manned with two junior officers per departments (Deck or Engine), the aggregated experience as junior OOW should not be less than 18 months. If one of three junior officers is below six months sea time as OOW then one of the two other officers should have a minimum of 12 months. Also, if the vessel is manned with three junior officers per department (Deck or Engine) the aggregated experience as junior OOW should not be below 18 months. If one of three junior officers is below six months sea time as OOW then one of the two other officers should have a minimum of twelve months sea time as OOW.

Once all changes are made then the SIRE online Officer's Matrix must be updated. The online version will calculate all year's entries. (INTERTANKO, 2015) The ship operator crew matrix on CDI and Sire database has been harmonized and this provides for a simplified solution to updating the crew matrix for both databases. At the time of a CDI inspection, the CDI inspector will continue to record the crew matrix information exactly in the same style and format as contained in the existing CDI ship inspection.

The following documents should also be kept ready to provide to the inspector in case they are asked.

1. All ship's officers' and ratings' licenses and flag administration endorsed certificates of competency if issuing country is different than the flag state of the vessel.
2. Records of each officer and ratings training courses attended, to include the ship's Security Officer's and Safety Officer's personal training certificates.
3. Records of the last unannounced alcohol tests taken on board
4. Record of the last unannounced drug and alcohol test taken by an external collector

5. Records of onboard inspection/maintenance for firefighting equipment.
6. Record of onboard inspection/maintenance of life saving equipment.
7. Records of when the life boats have been waterborne.
8. Records of emergency drills carried out.
9. Record of pollution clean-up drills.
10. Safety Committee Meeting minutes and company acknowledgment of same.
11. Non-conformities file with evidence of the close out.
12. Permit to work file (hot work, enclosed space entry, working at height) including risk assessment for each.
13. Records of monitoring ballast and void spaces
14. Records of ballast, tanks and void space inspections
15. Records of cargo tank pressure sensor alarm settings
16. Records of pressure testing vessel’s cargo hoses
17. Record of mooring winch Brake Holding Capacity tests.
18. SOLAS training and Fire Training manuals.
19. Fuel, lubrication and hydraulic oil analysis

The Physical Inspection

After the completion of the Documentation and Certification process of the inspection in the Master’s office, the inspector will proceed to the bridge, external accommodation, poop and main decks, pump room, cargo control room, machinery spaces, galley and food handling areas, internal accommodation, he will have an interview with the Chief Engineer with regard to scheduled maintenance and spare inventory levels, before finishing the close out meeting in the Master’s office. During the inspection a crew officer should be available to walk with the inspector during the process of physical inspection. The officer should be confident and capable to answer all questions posed by the inspector. The officer should remain focused at all times and not be distracted during the physical inspection.

For the inspection of the of the navigation section, the Navigation Officer will need to be present on the bridge supported by the Master.

For the inspection of the machinery spaces the inspector will need to be accompanied by the Chief or the 2nd Engineer and the Electrician may also be called if needed. The Chief Engineer is expected to execute the Vessel’s Planned Maintenance System and spare parts control system. The person who will accompany the inspector over the machinery spaces must be wearing protective uniform.

The inspector will expect to see a crew member demonstrate knowledge on how to use the equipment listed below and sometimes to start certain items of equipment given that it does not intervene with the vessel's operations.

- Lifeboat engines.
- Emergency generator using two separate starting methods.
- Emergency fire trump.
- Fan and fire dampers
- Funnel flaps
- Fire smothering systems
- Anti – pollution oil spill pumps
- Pressure/Vacuum valve, always take into consideration H2S content of the cargo.
- Foam monitors
- Fire/foam deck main isolation valves
- Donning breathing apparatus
- Pump room entry procedures
- Pump room extraction fan high level suction flaps.
- Cargo tank high level an overfill alarms
- Use of a portable oxygen meter to check O2 content of inter gas being delivered to the cargo tanks
- Visual inspection of the fore peak and up to two other water ballast tabks from the deck level only.
- Inter Gas System alarms and set point.

In the accommodation area the person in charge should prove knowledge of the use of the following:

- Navigation equipment
- Electronic Position Indicating Radio Beacon
- Switched Access Remote Test System
- Pyrotechnics

- Oil Discharge Monitoring Equipment
- Calibration of oxygen and combustible gas portable meters, and use of toxic gas detectors and what calibration gases to use for each meter type.
- Remote operation of the fuel oil tanks' quick closing valves
- Cold rooms locked-in alarms

Inside the machinery space the person in charge should demonstrate knowledge and the use of:

- Bilge alarms
- Main and auxiliary engine oil mist detector
- Bilge separator 15ppm alarm and 3-eaw valve
- Bilge well alarms
- Steering gear in normal and emergency modes
- Emergency air compressor
- High and low voltage earth leakage detectors.
- Emergency fire pump
- Planned maintenance system records and class approval certificate

The Master's role

The Master during the inspection will have to ensure the following:

- Before arrival, all on board advised an inspection will be taking place at the port and be properly prepared
- All ship staff are correctly dressed in the appropriate Personal Protective Equipment
- The safety security and well – being of the inspector are secured throughout the whole inspection.
- The inspector is not challenged about their experience, ability and qualification
- A ship's officer is always available to accompany the inspector at all times.
- The inspector can request for any testing that is not interfere or cause disruption to the safety of vessel's operations
- All crew members shall refrain from disputing with the inspector and answer all questions in a professional and honest manner. (INTERTANKO, 2015)

- Contact the company, if the Master believes that inspector is being unreasonable and any decision for further action will be taken by the company.

The inspection close-out meeting

The close out meeting is an extremely important part of the inspection where the Master and Chief Engineer should be present. At this part the inspector discusses the observations he made and sometimes this discussion can lead the inspector to delete the observations. The goal of the close-out meeting is to clear any doubt or misunderstandings to any observations the inspector has made during the inspection. Not all oil majors allow their inspectors to leave a list of observations. Thus, the Master should carefully write notes and report them back to the Shipping Company in detail. During the close out meeting should always ask the inspector officer to repeat and explain any questions that are not clarified or haven’t been raised.

The Response to the inspection

It is advisable for the company to wait until the full SIRE inspection report is received from the oil or chemical company who performed the inspection. The list of the observation left by the inspector sometimes differs from those in the report. If there are any negative observations that can be corrected by the ship’s staff, the company should communicate with the vessel and if required provide guidance on what the corrective action should be. The company when submitting its response should refrain from using replies such as “corrected” or “fixed”. The response to an observation should explain

- The root cause (What caused the “problem”?)
- The corrective action (“How the Company is going to fix it?)
- What has been done to prevent the mistake (Company should report what action took from prevent same mistake to happen in the future)
- How the lesson learnt will be spread to other vessels within the company’s fleet (It is important that all crew members are aware of all the above and make sure same mistake will not happen again)

Before responding to an observation in an inspection report, the company should decide which observations are actual objective deficiencies and those that are simply observations and not require any corrective actions.

The screening process

It is necessary to understand that vetting inspection is only a part of the screening process. The completion of SIRE report does not mean that any decision will be taken for the vessel's suitability to any particular vetting department. The outcome of the inspection as well as the owners' comments are used to help with the actual screening decisions by each vetting department or charterer. Each of the oil company that uses vetting procedure as the risk management tool has their own policies and schemes that fit the individual needs of each. The SIRE or CDI inspection is part of the process of each vetting group, as many other aspects and considerations are taken into account before the final evaluation and decision is made to accept a vessel for its nominated use. The screening process begins with the company completing the online Harmonized Vessel Particulars Questionnaire and Officer's Matrix. Both of these online facilities must be kept up to date by the company. After this there are three stages:

1. First, an oil or chemical company carries out an inspection of the vessel.
2. Second, the inspector's report (including any comments or observations) is provided to the operator for their response. The response from the company, known as "Owners comments," will be uploaded onto the SIRE and CDI database, from which members of the SIRE or CDI system can download it for evaluation.
3. Finally, individual SIRE or CDI members (chemical companies, terminals etc) can use the report to assist with making the eventual vetting decisions to satisfy their individual company policies.

Both SIRE and CDI systems involve the use of a standardized Vessel Inspection Questionnaire used by all the accredited inspectors.

Approvals

There are organizations that have a system of "approvals" which means a vessel is accepted by the organization for a specific time period. The term of approval is not used anymore by any vetting department, in most cases the vetting department of an organization will only screen a vessel when it is proposed for a particular business by the organization's chartering department. A screening decision will be based on the final report of the inspection but also, the individual vetting department assessment of the company, the previous history of the vessel, Port State Control archives and terminal reports Also, different organizations may be willing to accept different levels of risk. Some factors may be used to evaluate a vessel's suitability are the following:

- Class society that must be an IACS member
- Class survey status
- History of any recent changes of class
- Most recent dry dock and special survey
- Condition Assessment Program – CAP
- The age of the vessel
- The type of hull
- Flag state
- History of any recent changes of flag state
- Casualty history data
- Classed for the cargo to be carried
- Current owners
- History of any previous owners
- Company responsible for the day-to-day operation
- History of previous technical managers or operators
- Reputation of the technical managers or operators
- Reputation of the technical managers or operators
- Tanker Management and Self-Assessment latest edition Submission
- Officers Matrix
- Port State Control Inspections deficiencies
- Port State Control detentions
- USCG detentions
- USCG inspection deficiencies
- Latest SIRE inspection reports and company responses
- Terminal feedback
- Commercial feedback

2.9 OFFSHORE VESSEL INSPECTION DATABASE (OVID) PROGRAMME

OCIMF and Oil & Gas organization introduced the initiative called Offshore Vessel Inspection Database Program (2009). Participation in this program is voluntary and the recipient of the program will determine independently all the information included in the questionnaire received from OCIMF. On July 1st, 2017, OCIMF launched the 3rd edition of the Offshore Vessel Inspection Questionnaire. (OCIMF, 2018)

How it works?

Member companies of OCIMF arrange offshore vessel inspections and appoint and a well-trained inspector officer to complete an assessment. The inspector have access to the ship's characteristics from the OVID and does an on-board inspection of activities and examines the safety operations and pollution prevention plans. The final report of the inspector will contribute to the overall company's risk assessment in advanceo f charter.

Benefits of OVID Program

OVID Program is opening the path and is leading the offshore vessel industry in a long-term picture of safer and pollution free operations in high seas. Using the experience of SIRE program, the goal of the OVID program is to use the extensive database of the inspection reports to eliminate the number of repeat inspection of the offshore vessels and reduce the work of the crew of the offshore vessel. By the end of the inspection and report procedure the vessel operators will be able show the vessel's capabilities to potential charterers and promote a positive image to clients.

Just like the SIRE program the OVID requires that submitting company undertakes a uniform Vessel Inspection Procedure includes the ***Inspection Element*** and the ***Report Element.***

- ✓ The **Inspection Element** includes very detailed inspection questionnaires that are related with safety management issues and pollution prevention and are unique for the type of inspected vessel.
- ✓ The **Report Element** is developed once the inspection questionnaire is completed and submitted by the inspector. (OCIMF, 2018)

The OVID Vessel Inspection Questionnaire is divided in two main parts:

1. The questionnaire of the offshore inspection includes assess the operation and procedures that are followed on board. The OVID Software uses specialized tools that develop different questions for different types of vessels.
2. The questionnaire that examines the features of the vessel named OVPQ it is answered by the operating company, and it is related to the permanent features of the vessel (capacity of the tank, height of the vessel, LOA etc.) (OCIMF, 2018)

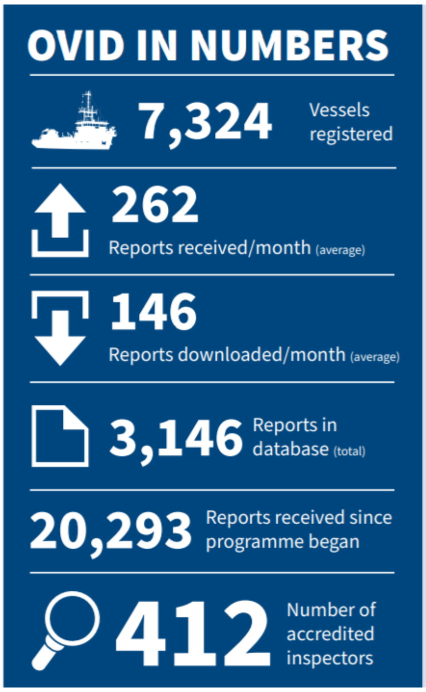


Figure 28: Offshore Vessel Inspection Database (OVID) (OCIMF, 2018)

The 3rd edition of Offshore Vessel Inspection Database (OVID) Program is divided in 15 big chapters- areas of inspection. (OCIMF, 2018)

Chapter 1 – General Information

Chapter 1 of OVIQ contains the general characteristics of the inspected vessel: what is the name that is given to the ship, what is the IMO number, country of registration, Gross tonnage etc. and information of operator and the inspector.

Chapter 2 – Certification and Documentation

Chapter 2 of OVIQ examines several certificates such as: the name of Classification Society of the Vessel, name of P&I Club, a formal safety management system and dry dock documents.

Chapter 3 – Crew and contractor management

Chapter 3 examines what policies are implemented by the vessel operator for the crew. Do both crew and contractor comply with the safety management system (SMS), do they comply with the drug and alcohol policy, are they qualified for the operation and with the equipment on board?

Chapter 4 – Navigation

Chapter 4 of OVIQ examines if the required navigation procedures are followed on board. For example, does the 500 meters safety zone entry procedure applied? Are there enough experienced crew member on bridge? Does the ship has an Electronic Chart Display and Information System? Is navigation equipment in good order?

Chapter 5 – Safety and Security Management

In Chapter 5 of OVIQ it is examined whether the general safety and security measures are maintained onboard. For example, the vessel should be properly equipped with protective equipment and have enough spares such as safety footwear, boiler suit, protective gloves etc. The officers of the vessel should be familiar with fire fighting live saving and other emergency equipment, have a clean and tidy hospital ready for use and have a Ship Security Plan certification.

Chapter 6 – Pollution Prevention and Environmental Management

Chapter 6 of OVIQ is giving guidelines regarding the pollution prevention plan, the emergency marine pollution plan, the ballast water management and waste management.

The rest of the chapters including in the OVIQ are the following:

Chapter 7 – Structural Conditions

Chapter – 8 Operations

Chapter – 9 Mooring

Chapter – 10 Communications

Chapter – 11 Propulsion, power generation and machinery

Chapter – 12 General appearance and condition

Chapter – 13 Ice operations

Chapter – 14 Helicopter Operations

Chapter – 15 DP operations

2.10 CDI – CHEMICAL DISTRIBUTION INSTITUTE

CDI Chemical Distribution Institute

The Chemical Distribution Institute was founded 25 years ago by a group of chemical companies: Agility Company, BP Chemicals, Shell Chemicals, The Dow Chemical Company and ExxonMobil. The goal of CDI was to create an inspection system that could provide data on chemical gas carriers. Then the participating chemical companies can use the information to assess the suitability of a vessel. To make sure the information is provided in a standardize form that chemical companies could use globally CDI used its own trained inspector. Today CDI is developed into an international recognized institute that has 64 member-chemical companies and developed additional system for risk elimination such as the CDI Terminal Inspection Scheme and the CDI International Marine Packed Cargo Audit Scheme (IMPCAS). The CDI has now a leading role in providing information on safety management and maintaining high quality standards in sea transportation and operations in chemical industry. In addition, CDI contributes to industry safety through its many publication and best practice guidelines for seafarers, vessels and terminal operators.

CDI is a Dutch non-profit organization founded by chemical companies that operates from offices in UK. Over the last years CDI developed a significant number of technical and scientific publications using the expertise of chemical industry and marine transport industry (Chemical Companies, Terminal Operators, Ship Operators and Logistic Service Providers). Some of the publications include:

- “Bulk liquid chemical handling guide”
- “Chemical Tankers. -A pocket safety guide”
- “CDI guidelines for liquid chemical hose management.”

CDI is also responsible for the training of inspector and auditors to provide inspections and audit reports for use in the risk assessment process. There are about 250 inspectors and auditors globally appointed by CDI to conduct CDI inspections around the world.

CDI objectives

- Improvement of safety, security and quality performance of marine transportation and storage for the chemical industry.
- Be the number one organization of industry best practice in marine transportation and storage of chemical products by work with industry and education channels
- To monitor current and future international legislation and provide experience, knowledge from chemical industry to legislators.
- To provide chemical companies with cost effective systems for risk assessment.
- Offer to chemical companies reliable information and data and use them int the future.
- To provide the chemical industry with an independent organization for training, qualification and accreditation of inspectors but also for development and maintenance of databases on which inspection and risk assessment information can be published. (INTERTANKO, 2015)

The three schemes of CDI

1994 CDI Marine

CDI-M was created by chemical industry to enhance the safety and quality standards of bulk liquid shipping on chemical tankers. CDI Marine offers annual inspection reports on the world fleet of chemical and liquid petroleum gas tankers.

(INTERTANKO, 2015). The inspections are conducting by one hundred well trained inspectors located globally in several ports around the world. CDI Marine provides information to EQUASIS.

1997 CDI Terminals

The CDI-T scheme was created in 1997 similar to CDI-M scheme. CDI Terminal was created to enhance the safety and quality performance of bulk liquid storage terminals. More than 50 CDI Terminal well trained inspectors carry out technical inspections of liquid storage terminals all over the world. Over two hundred terminals are already inspected in a global scale and big chemical storage terminal companies are members of CDI-T. (INTERTANKO, 2015)

2002 International Marine Packed Cargo Audit Scheme (IMPCAS)

The IMPCAS is one of the largest schemes globally that includes over 100 auditors around the world based in major container handling ports. The goal of the IMPCAS is to provide audit reports on every category of service provider related in the marine distribution supply chain. The scheme extends to include: Shipping Companies, Ships, Tank Container Operators, Container Freight Stations, Freight Forwarders, Agents and Container Terminals.

2.11 VETTING COMPANY REQUIREMENTS

2.11.1 BP SHIPPING LTD

bp

2.11.2 VESSEL SCREENING

Vessels are screened on each occasion they are proposed for BP Group business by a BP entity. This includes carrying a BP cargo or visiting terminals or facilities operated by BP Group. Evaluation of the suitability of vessels for a BP operation is carried out by BP Shipping's Vetting and Clearance teams based in Melbourne, Shangai, Amsterdam, London and Chicago. Screening of vessels will not be carried out at the request of any third parties including ship owners.

If a vessel is approved for a BP operation, this approval would be valid only for that operation. If the vessel is proposed for a subsequent BP operation, it will be screened again by the Vetting and Clearance team. An approval in the past doesn't mean the vessel will be approved for another BP operation in the future. Approval to use a vessel for BP operation will be based on review of all available information concerning the performance of the vessel, its manager and the fleet. The vessel screening process may also be affected by future international or national legislative changes in BP group policy. BP Shipping respects the international conventions and standards including guidance provided by OCIMF, SIGTTO and those contained in documents like ISGOTT. BP Shipping considers as best practice that all chemical and oil vessels should be outfitted with SOLAS compliant Inert Gas System. Any cargo tanks loaded with chemical cargoes having a Flash Point of less than 60 degrees should be inerted with Nitrogen in accordance with the CDI Best Practice Recommendation Regarding the use of Nitrogen.

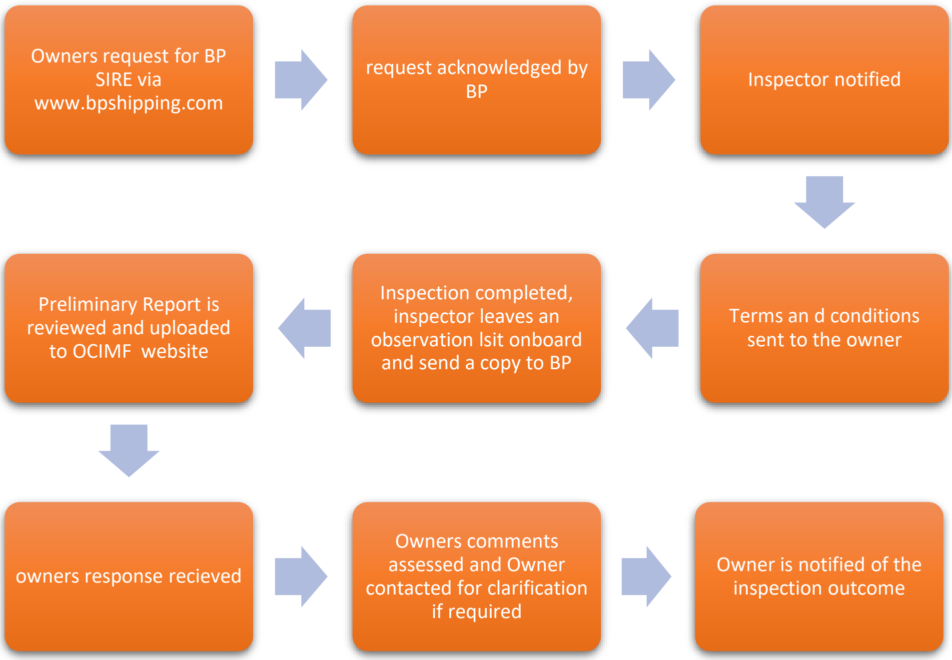
Casualty and port state inspection reports are received daily into the BP Shipping's database. Where a vessel has a Port State Control inspection with deficiencies, owners should send a PSC deficiency close out report to vettingbp.com so that this can be reviewed as part of the vessel screening process when that vessel is proposed for BP operation. Owners are encouraged to send their incident reports to the OCIMF incident report repository set up by OCIMF at the request of INTERTANKO. These reports feed directly into BP's database and removes the need to send the reports to BP separately.

2.11.3 VESSEL INSPECTION PROCESS

BP Shipping employs the OCIMF SIRE inspection format (VIQ) as the vessel inspection tool for all third pathy hydrocarbon carrying vessels. All inspections carried out by BP Shipping under the SIRE system are submitted to the OCIMF SORE database. Every SIRE report issued by a BP inspector is reviewed by a Vetting and Clearance Superintendent prior to its release to the vessel manager via the OCIMF SIRE program. The CDI inspection protocol is not utilized for screening of vessels for BP operations. BP Shipping requires all Documents of Compliance holders to have submitted valid TMSA to OCIMF that is not more than 12 months old that is not more than 12 months old at the time of their vessel's nomination for BP business.

A SIRE inspection request must be received at least three days in advance of the proposed inspection date. Upon receipt of such request and where applicable the Assessment and Inspection team confirms the inspection date and forwards terms and conditions, a general overview of the inspection process and related documentation.

The SIRE inspector will accept the electronic copies of ISM audits, reports and the vessel's trading certificates, provided that the inspector has no reason to doubt the authenticity of the document. The ship owner and the crew on board must ensure safe vessel access to the inspector. Vessel inspection is undertaken when the vessel is within port limits during daylight hours under a safe environment while conducting cargo loading and discharging operations.



Vessel Age

BP Marine Policy requires all vessel's proposed for BP Operations to meet the following criteria:

Vessels ≥ 5,000 DWT carrying Oil or Chemical cargo in bulk	**Max 20 years**
Vessels ≤ 5,000 DWT carrying oil or chemical cargo in bulk	Max 25 years
Vessel's carrying LPG in bulk	Max 25 years
Vessel's carrying LNG in bulk	Max 40 years
Inland waterway vessels (inland voyages)	No age limit

Combination Carriers	Max 15 years
Ocean tugs	No age limit

2.11.4 SIRE REPORT REQUIREMENTS

Vessel Inspection

When a vessel is proposed for BP business the vessel must have a current operational SIRE inspection report that is less than 6 months old, BP shipping will continue to carry out SIRE inspections of vessels and to that effect, will continue to manage a pool of SIRE inspectors. BP SIRE inspectors will be carried out on vessels where there is added value and increased assurance to BP.

TMSA

BP promotes the use of the Tanker Manager's Self – Assessment (TMSA) and makes it mandatory for all vessels screened for BP operations to have satisfactory TMSA submission at an interval of not more than 12 months. The screening process takes into account the current status of TMSA submission and uses the TMSA elements and stages as the basis of conducting an assessment of vessel manager's safe operations.

For time charter or potential time charter, BP will visit DOC holder's office to conduct an on-site assessment of its TMSA submission to verify compliance with OCIMF established Key Performance Indicators and Best Practice Guidance.

Structural Assurance

Vessel classed as Oil, Chemical or LPG carriers over 15 years of age and over 20,000 DWT will be required to hold a valid Condition Assessment Program rating of Level 2 for Hull structure only.

LNG carriers over 20 years age are required to hold a valid CAP 2 rating or higher for Hull structure only.

New building requirements

No inspection is undertaken at dry-dock however a request for a SIRE inspection will be accepted on delivery from the shipyard in accordance with Vessel's Inspection Process. A vessel that is proposed for a BP Shipping time charter that will commence immediately on delivery from the builders shipyards, the Vetting and Clearance team will carry out a detailed assessment that may lead to an action plan by the ship owner to mitigate any highlighted risks. A New Build Questionnaire should be submitted by the DOC holder of the vessel via www.bpshipping.com . Vessels may be considered for acceptance under the New Built Questionnaire up to three months from delivery, during which period an operational SIRE inspection must be completed.

Officer's experience matrix

The Vetting and Clearance team uses this Matrix as guidance when reviewing any OCIMF SIRE inspection report:

Senior Officers	Master	Chief Officer	Chief Engineer	2nd Engineer
Calendar time with Company	Aggregate not less than 2 years		Aggregate not less than 2 years	
Sea time in rank	Aggregate not less than 3 years		Aggregate not less than 3 years	
Sea time on all types of tankers	Aggregate not less than 6 years		Aggregate not less than 6 years	
Certificate in training for oil and chemical or gas operations	Advanced Level		Advanced Level	
Date of joining	Minimum 2 weeks between joining dates		Minimum 2 weeks between joining dates	
Junior Officers	2/0	3/0	3/E	4/E
Sea time as an offer	Aggregate not less than 1 year		Aggregate not less than 1 year	
Certificate in training for oil and chemical or gas operations	As required by STCW		As required by STCW	
Date of joining	Minimum 2 weeks between joining dates		Minimum 2 weeks between joining dates	

2.12 THE GREEN AWARD ORGANIZATION-MISSION & GOVERNING BOARD

Green Award is an international organization that provides quality assessments certifications to ships through inspection process. Green award offers certification that goes beyond the industry standards in terms of safety, quality and environmental performance. It is a non-profit, independent, international organization that focuses mainly on environmental performance and safety in shipping. The mission of the company is to lead environmentally responsible shipping. Green award organization was established in 1994 and it is operating as a quality mark for high performing vessels. During the last decades the shipping industry faced some serious crisis from oil spill accidents that happened during voyages due to low international safety standards. The goal/essence of the quality assessment certification is to motivate shipping companies to operate in a more responsible and environmentally friendly manner. To assess the safety management and pollution prevention measures of a company GA Organization developed a certification plan that examines several factors such as equipment suitability, management of the company, the workforce and possible initiatives for improvements.

2.13 CERTIFICATION/ INSPECTION PROCEDURE

During the office audits GA Organization aim is to assess the management scheme of the company, operation policies that are implemented and the interaction with the office employees.

Once the office audit is completed a survey to the ship follows: the initial review includes a desktop documentation review and then follows a survey onboard. The company will receive in the end two Green Award certifications for the office and ship inspection accordingly. Certificates for ship and office audits last for 3 years.

Figure 29: Application procedure (Green Award, 2021)

The ship types that are eligible for Green Award certification are

- oil tankers smaller than 2000DWT

- dry bulk carriers smaller than 20.000DWT
- LNG Carriers –all sizes
- Chemical tankers less than 2000DWT
- Container carriers less than 5000 DWT
- LPG carriers (all sizes)
- RoRo Cargo ships (all sizes)
- Off shore supply ships (all sizes)

Green Award office audits and onboard ship surveys are additional to other audits or inspections that take place in the industry such as Vetting, Port State Control and Classification societies with the aim to assist in continuous improvement in safe operations and environmental protection with a strong focus on the human element. First the office audits to take place and then follows the survey on board.

Certified Companies

A potential company wishes to be certified by Green Award should have minimum one vessel and is able to meet Green Award standards. Certified Companies enjoy plenty of incentives

- Independent audit performed by well-trained auditors that work only for Green Award.
- All the surveys' results are confidential and only the inspected company will be informed about remarks for improvement.
- The certified company will enjoy the privilege of potential prevention of PDC detention or serious incidents
- Several tools to maintain and improve safety, quality and environmental standards
- discounts on the port dues
- discount on services
- discount on product
- special extra service
- Promotion and publicity: certified companies can use the logo of Green Award website and other promotional materials, invitations to annual events etc.

2.14 LIST OF CERTIFIED COMPANIES

Name	Ships	
"K" Line Energy Ship Management Co. Ltd.	LNG Carrier	AL RAYYAN
	LNG Carrier	ZEKREET
"K" Line LNG Shipping (UK) Limited	LNG Carrier	AL ORAIQ
	LNG Carrier	AL THAKHIRA
	LNG Carrier	ARCTIC DISCOVERER
	LNG Carrier	ARCTIC VOYAGER
	LNG Carrier	SYMPHONIC BREEZE
	LNG Carrier	TRINITY ARROW
	LNG Carrier	UMM AL AMAD
Aegean Bulk Co Inc	dry bulk carrier	ANNA MARIA
	dry bulk carrier	INCEPTION
Altera Infrastructure Norway AS	oil tanker	AMUNDSEN SPIRIT
	oil tanker	AURORA SPIRIT
	oil tanker	CURRENT SPIRIT
	oil tanker	NANSEN SPIRIT
	oil tanker	PEARY SPIRIT
	oil tanker	RAINBOW SPIRIT
	oil tanker	SCOTT SPIRIT
Anglo-Eastern Shipmanagement (Singapore) Pte Ltd	LPG carrier	CRYSTAL ANGEL
	LPG carrier	CRYSTAL LAVENDER
	LPG carrier	CRYSTAL SUNRISE
	LPG carrier	CRYSTAL VALERIAN
Arab Maritime Petroleum Transport Company	oil tanker	ALBURAQ
	oil tanker	ALDANA
	oil tanker	BREEZE
	oil tanker	SEA BEAUTY
	oil tanker	SEA ICON
	oil tanker	SEA JEWEL
	oil tanker	SEA LEGEND
	oil tanker	SEA SHELL
	oil tanker	SEA STAR
Arcadia Shipmanagement Co. Ltd.	oil tanker	AEGEAN ANGEL
	oil tanker	AEGEAN DIGNITY

	oil tanker	AEGEAN DREAM
	oil tanker	AEGEAN HARMONY
	oil tanker	AEGEAN HORIZON
	oil tanker	AEGEAN MARATHON
	oil tanker	AEGEAN MYTH
	oil tanker	AEGEAN NOBILITY
	oil tanker	AEGEAN POWER
	oil tanker	AEGEAN UNITY
	oil tanker	AEGEAN VISION
Chandris (Hellas) Inc.	oil tanker	ELLINIS
	oil tanker	SERENEA
Delta Tankers Ltd.	oil tanker	DELTA CAPTAIN
	oil tanker	DELTA PIONEER
	oil tanker	DELTA SAILOR
	oil tanker	DELTA STAR
	oil tanker	DELTA VICTORY
Eaglestar Shipmanagement (S) Pte Ltd	oil tanker	EAGLE BINTULU
	oil tanker	EAGLE BRASILIA
Eastern Pacific Shipping Pte Ltd.	oil tanker	CASPIAN SEA
	oil tanker	IBERIAN SEA
	oil tanker	LEVANTINE SEA
	oil tanker	LEVANTINE SEA
	oil tanker	TYRRHENIAN SEA
Empire Bulkers Ltd	dry bulk carrier	PANAGIOTIS
Empire Navigation Inc	oil/chemical tanker	GUNMETAL JACK
Exmar Shipmanagement NV	LPG carrier	BASTOGNE
	LPG carrier	ELISABETH
	LPG carrier	JOAN
	LPG carrier	KNOKKE
	LPG carrier	KOKSIJDE
	LPG carrier	BASTOGNE
Fleet Management Limited	oil/chemical tanker	CHEMICAL LUNA
	oil/chemical tanker	CHEMICAL MASTER
	oil/chemical tanker	CHEMICAL VOYAGER
GEFO Gesellschaft für Oeltransporte mbH	oil/chemical tanker	BARTOK
	oil/chemical tanker	BEETHOVEN
	oil/chemical tanker	BERNSTEIN
	oil/chemical tanker	BRAHMS
	chemical tanker	CAVALLI

	oil/chemical tanker	CORELLI
	oil/chemical tanker	MOZART
	oil/chemical tanker	NABUCCO
	oil/chemical tanker	NORMA
	oil/chemical tanker	OTELLO
Goodwood Ship Management Pte Ltd		
Iino Marine Service Co. Ltd		
International Tanker Management Limited	oil tanker	SONANGOL HUILA
	oil tanker	SONANGOL KALANDULA
	oil tanker	SONANGOL MAIOMBE
	oil tanker	SONANGOL NAMIBE
	oil tanker	SONANGOL PORTO AMBOIM
KNOT Management AS	oil tanker	ANNELEEN KNUTSEN
	oil tanker	BODIL KNUTSEN
	oil tanker	GIJON KNUTSEN
	oil tanker	GRENA KNUTSEN
	oil tanker	HILDA KNUTSEN
	oil tanker	INGRID KNUTSEN
	oil tanker	SIRI KNUTSEN
	oil tanker	TORILL KNUTSEN
Kuwait Oil Tanker Co. S.A.K.	oil tanker	AL FUNTAS
	oil tanker	AL JABRIYAH II
	oil tanker	AL RIQQA
	oil tanker	AL SALMI
	oil tanker	AL YARMOUK
	oil tanker	DAR SALWA
	oil tanker	KAZIMAH III
	oil tanker	UMM AL AISH
Latsco Marine Management Inc.	LPG carrier	HELLAS HERCULES
	oil tanker	KING PHILIPPOS
	oil tanker	LADY HENRIETTA
Maersk Tankers A/S	oil/chemical tanker	BRO NAKSKOV
	oil/chemical tanker	BRO NIBE
	oil/chemical tanker	BRO NISSUM

	oil/chemical tankerBRO NORDBY oil/chemical tankerBRO NUUK oil/chemical tankerBRO NYBORG oil/chemical tankerMAERSK BRISTOL
Maran Gas Maritime Inc.	LNG CarrierAL JASSASIYA LNG CarrierMARAN GAS ASCLEPIUS LNG CarrierSIMAISMA LNG CarrierUMM BAB
Maran Tankers Management Inc.	oil tanker MARAN APHRODITE oil tanker MARAN ARES oil tanker MARAN ARIADNE oil tanker MARAN ARTEMIS oil tanker MARAN ATHENA oil tanker MARAN CANOPUS oil tanker MARAN HELIOS oil tanker MARAN HERMES oil tanker MARAN HERMIONE oil tanker MARAN HOMER oil tanker MARAN PLATO oil tanker MARAN POSEIDON oil tanker MARAN PYTHIA oil tanker SOPHIA
Minerva Marine Inc	oil tanker MINERVA ALICE oil tanker MINERVA BALTICA oil tanker MINERVA CORALIA oil tanker MINERVA ELPIDA oil tanker MINERVA GLORIA oil tanker MINERVA OLYMPIA oil tanker MINERVA PISCES oil tanker MINERVA VERA oil tanker MINERVA ZENOBIA
MOL LNG Transport (Europe) Ltd.	LNG CarrierAL AAMRIYA LNG CarrierAL DEEBEL

	LNG Carrier	FRAIHA
	LNG Carrier	FUWAIRIT
	LNG Carrier	MURWAB
	LNG Carrier	POINT FORTIN
MOL LNG Transport Co. Ltd.	LNG Carrier	AL BIDDA
	LNG Carrier	AL WAJBAH
	LNG Carrier	AL WAKRAH
	LNG Carrier	AL ZUBARAH
Nakilat Shipping (Qatar) Limited	LNG Carrier	AL DAFNA
	LNG Carrier	AL GATTARA
	LNG Carrier	AL GHARRAFA
	LNG Carrier	AL GHASHAMIYA
	LNG Carrier	AL GHUWAIRIYA
	LNG Carrier	AL HAMLA
	LNG Carrier	AL KHARAITIYAT
	LNG Carrier	AL MAFYAR
	LNG Carrier	AL MAYEDA
	LNG Carrier	AL REKAYYAT
	LNG Carrier	AL SADD
National Iranian Tanker Company	oil tanker	SALINA
NYK LNG Shipmanagement (UK) Ltd.	LNG Carrier	AL SAHLA
	LNG Carrier	AL THUMAMA
	LNG Carrier	AL UTOURIYA
	LNG Carrier	EJNAN
	LNG Carrier	LUSAIL
NYK LNG Shipmanagement Ltd.	LNG Carrier	AL JASRA
	LNG Carrier	AL KHOR
	LNG Carrier	AL SAHLA
	LNG Carrier	AL THUMAMA
	LNG Carrier	AL UTOURIYA
	LNG Carrier	BROOG
	LNG Carrier	DOHA
	LNG Carrier	EJNAN
OSM Ship Management AS	oil tanker	EAGLE BALDER
	oil tanker	EAGLE BARENTS
	oil tanker	EAGLE BERGEN
	oil tanker	EAGLE BLANE
OSM Ship Management Finland Oy	oil tanker	STENA ARCTICA
Pronav Ship Management GmbH & Co KG	LNG Carrier	AL GHARIYA
	LNG Carrier	AL RUWAIS
	LNG Carrier	AL SAFLIYA
	LNG Carrier	DUHAIL

	LNG CarrierMILAHA QATAR LNG CarrierMILAHA RAS LAFFAN
SCF Management Services (Dubai) Ltd	oil tanker GAGARIN PROSPECT oil tanker KOROLEV PROSPECT oil tanker LIGOVSKY PROSPECT oil tanker LITEYNY PROSPECT oil tanker LOMONOSOV PROSPECT oil tanker MENDELEEV PROSPECT oil tanker MOSKOVSKY PROSPECT oil tanker NEVSKIY PROSPECT oil tanker OLYMPIYSKY PROSPECT
Seaven Tanker Management Inc	oil/chemical tankerEVIAPETROL V
Shell International Trading & Shipping Co Ltd	LNG CarrierAAMIRA LNG CarrierAL BAHIYA LNG CarrierAL KARAANA LNG CarrierAL KHATTIYA LNG CarrierAL NUAMAN LNG CarrierRASHEEDA LNG CarrierSHAGRA LNG CarrierZARGA
SIA TB Marine Shipmanagement (Riga) Christiania Shipping A/S	oil/chemical tankerANNELISE THERESA oil/chemical tankerCAROLINE THERESA oil/chemical tankerCHARLOTTE THERESA oil/chemical tankerJETTE THERESA oil/chemical tankerKARINA THERESA oil/chemical tankerSOFIE THERESA

	oil/chemical tanker SUSANNE THERESA
Synergy Maritime Pvt. Ltd.	oil/chemical tanker BLUE BUTTERFLY container carrier CAP SAN MALEAS dry bulk carrier NORD BISCAY LPG carrier TRAMMO PARIS
Teekay Shipping (Glasgow) Ltd	LNG Carrier AL AREESH LNG Carrier AL DAAYEN LNG Carrier AL HUWAILA LNG Carrier AL KHARSAAH LNG Carrier AL KHUWAIR LNG Carrier AL MARROUNA LNG Carrier AL SHAMAL
Thenamaris Ships Management Inc.	oil tanker BERGEN TS oil tanker ELIAS TSAKOS oil tanker EURO oil tanker LEONTIOS H oil tanker MARATHON TS oil tanker OSLO TS oil tanker PARTHENON TS oil tanker PROMITHEAS oil tanker PROPONTIS oil tanker PROTEAS oil tanker SOLA TS oil tanker STAVANGER TS oil tanker THOMAS ZAFIRAS
Tsakos Columbia Shipmanagement (TCM) S.A.	oil tanker BERGEN TS oil tanker ELIAS TSAKOS oil tanker EURO oil tanker LEONTIOS H oil tanker MARATHON TS oil tanker OSLO TS oil tanker PARTHENON TS oil tanker PROMITHEAS oil tanker PROPONTIS oil tanker PROTEAS oil tanker SOLA TS oil tanker STAVANGER TS oil tanker THOMAS ZAFIRAS

Van Wijngaarden Marine Services B.V.	offshore supply ship LINGESTROOM
Wallem GmbH & Co. KG	oil tanker BREIVIKEN oil tanker DOLVIKEN oil tanker EIKEVIKEN oil tanker ERVIKEN oil/chemical tankerINVIKEN oil tanker JO PINARI oil tanker KRONVIKEN oil tanker MORVIKEN oil/chemical tankerNORVIKEN oil tanker SOLVIKEN oil/chemical tankerSTAVANGER PIONEER oil/chemical tankerUTVIKEN
Wallem Shipmanagement Ltd	oil tanker SONANGOL CABINDA oil tanker SONANGOL CAZENGA oil tanker SONANGOL KASSANJE oil tanker SONANGOL RANGEL oil tanker STORVIKEN

Figure 30: List of certified ships (Green Award, 2021)

2.15 COLLABORATIONS

Green Award Organization collaborates with ESI, Environmental Ship Index. ESI started by several ports through the World Ports Sustainability Program under the International Association of Ports and Harbors (IAPH) to improve air quality. The objective of ESI is to reduce emissions of NOx and Sox and particulates, as well as emission of CO2 in long term by bringing changes in behavior among ship owners/ operators and ports. Green Award Organization ESI into the Green Award checklist requirements. In Addition, Green Award established a bonus point system to encourage the submitted companies to undertake an inspection. For example, a company wins 50 points when enrolls the operated ships into ESI database. A company wins 20 points when the ship scores more than 30 ESI points after the inspection, 40 points if the ship scores more than 40 ESI points, and 60 points if the ship scores more than 50 ESI points. (Green Award, 2021).

2.16 INCENTIVE PROVIDERS (ΠΑΡΟΧΟΙ ΚΙΝΗΤΡΩΝ)

Green Award is an organization that applauds and encourages safety, quality and environmental performance of ships. Thus, GA built a wide international network of 160 incentive providers that provide a variety of benefits to the ships that have Green Award Certificate. For example, Port of Kobe was one of the latest members that joined GA. Port of Kobe is providing 10% discount in port entrance dues to ship that have GA certification. The development of the incentive network opens the path for more companies to join the initiative for “greener” sea transportation. The above listed certified ships are committed to improve their safety and environmental performance and beyond the international standards. (Green Award, 2021).

2.17 FLAG STATE INSPECTIONS

2.17.1 DEFINITION OF FLAG STATE

The Flag under which the vessel is registered is highly significant, as it determines the legislation, the regulation and the jurisdiction under which the vessel operates. In addition, Flag state establishes rules and new regulations regarding environmental and safety issues, as well as the relative requested documents by the authorities. A very known term regarding Flag states is the “Flag of convenience”, which is a category of flag states that many shipowners use and incorporate the operations of their vessels to their legislation, so as to register their vessels to ta country which is different from the shipowner’s nationality. The main aim to register a vessel to a Flag of convenience is the tax avoidance, the avoidance of national regulations that are probably inconvenient for the operation of the shipping company and the option that is provided for the employment of foreign onshore personnel. Furthermore, it should be noticed that the maintenance and registration costs are lower for this flag category, than other categories. A shipowner has the ability to change the flag state of the fleet, according to a predetermined procedure which analyses the steps that are required for the flag state change. Firstly, the shipowner should provide with a list of requested documents, that are related with the equipment, the machinery and the characteristics of the personnel. A vessel may be registered to a new flag state, only after it is deleted from the previous flag state. Once the process of changing the flag is completed, certificates of the current state are issued. On the meanwhile, interim certificates are issued for vessels during the period the flag is under change process.

2.17.2 DEFINITION OF FLAG STATE INSPECTIONS

Flag Inspections are used by the Flag states to confirm and ensure that the criteria and standards set from the authorities, are met and satisfied. They are undertaken by approved Flag Inspectors, who examine the corresponding documents, and also the vessel’s equipment, the safety practices, the structure and the compliance with all the safety rules, ILO conventions and regulations. According to Flag State inspections’ procedures, MLC, ISM/ISPS audits and statutory certificates endorsements are performed. Some of the most significant responsibilities of Flag inspections are the below:

- The State should appoint the appropriate inspectors so as to implement the tasks assigned by the authorities.
- Monitoring, inspection and other control measures
- Responding to seafarer complaints
- Responding to requests for information providing, from Port State Control authorities
- Corrective actions to be taken, in case that the vessels of the fleet do not operate in compliance with the requirements of the regulations.

Flag State should establish the appropriate systems, regarding inspections and maritime personnel conditions, which may ensure that there is a sufficient number of experienced and qualified inspectors, the development of new rules, regulations, guidelines and the assignment of new tasks and responsibilities.

2.17.3 CLASSIFICATION OF FLAG STATES

According to Lloyd's list and the most recent data published for 2020, we may conclude that Panama flag was in the top position among the top 10 flag states. The classification of state flags was conducted according to the Deadweight Tonnage and Net Tonnage of each state for year 2020. Panama flag recorded a growth of 4.4% for this year, with the Gross Tonnage to be amounted to 235 million gross tonnes approximately. This amount corresponds to the 16% of the global fleet tonnage. The greatest decrease in the classification was occurred for Greece, which was led in the 9th position, followed only by Japan. The classification of the flag states is analysed more in the below figure:

Flag	Country	Gross tonnage	Deadweight tonnage	No of vessels
PAN	Panama	234,735,311	350,511,465	9,596
LBR	Liberia	187,801,367	299,328,061	4,295
MHL	Marshall Islands	170,971,422	276,364,868	4,313
HKG	Hong Kong	130,306,076	206,273,017	2,739
SGP	Singapore	96,100,980	142,956,323	4,914
MLT	Malta	82,442,533	116,278,717	2,588
CHN	China	61,065,326	91,718,247	5,130
BHS	Bahamas	64,126,903	77,340,553	1,474
GRC	Greece	38,041,961	65,754,639	1,527
JPN	Japan	28,688,956	42,932,996	3,852

Figure 31: Top 10 flag states - gross tonnage (Lloyd's List Intelligence, 2020)

In the top positions, below the Panama flag, were also held Liberia flag (in the second position) and Marshall Islands flag (in the third position). At the bottom of this classification are held Greece (the position has been dropped in a high level) and Japan with 29 million of gross tonnage approximately.

2.17.4 BLACK, GREY AND WHITE FLAGS

In order to assist the PSC inspections in the selection of the ships for inspection, the MoUs publish the annual Black, Grey, White lists, in which the detentions imposed on their ships by foreign PSC are presented. Based on these data, the performance of each flag state is calculated, and they characterize the flags as high or low or standard risk. Poorly performed flags are classified as high risk. These lists are considered about the next inspection. However, the White list shows the quality flags that have a low number of detained ships, and the Grey list shows the flags with average performance. Appearing a flag on the grey list can operate as an incentive to improve to return to the white list. Respectively, a flag that is low on grey list must try not to jump blacklisted. The flags that appear in the white lit are considered more stringent than adoption of regulations but also in terms of their implementation. The performance of the company contributes important in the ranking of ships. A ship that wants to rise in ranking must select a flag from the white list.

The tables below show the lists from Paris MoU which concerns a three-year period for flags according to which the total number of inspections and detentions is examined. The time period they cover is from 2018 to 2020.

RANK	FLAG	INSPECTIONS 2018-2020	DETENTIONS 2018-2020	BLACK TO GREY LIMIT	RISK	EXCESS FACTOR
BLACK LIST						
62	Tuvalu	39	6	6	Medium	1.09
63	Sierra Leone	312	33	30	Medium	1.30
64	Tanzania, United Republic of	276	30	27	Medium	1.34
65	Belize	283	31	27	Medium	1.37
66	Moldova, Republic of	350	41	33	Medium	1.69
67	Comoros	336	45	32	Medium to High	2.17
68	Togo	430	60	39	Medium to High	2.44
69	Cameroon	45	10	6	Medium to High	2.97
70	Albania	74	17	9	High Risk	3.80

Figure 32: Black List (Paris MoU, n.d.)

RANK	FLAG	INSPECTIONS 2018-2020	DETENTIONS 2018-2020	BLACK TO GREY LIMIT	GREY TO WHITE LIMIT	EXCESS FACTOR
GREY LIST						
40	Estonia	71	1	9	1	0.01
41	Saudi Arabia	54	1	7	0	0.11
42	Korea, Republic of	68	2	9	1	0.15
43	India	44	1	6	0	0.18
44	Philippines	133	6	15	4	0.19
45	Kazakhstan	34	1	5	0	0.27
46	Poland	68	3	9	1	0.28
47	Curacao	46	2	7	0	0.32
48	Saint Vincent and the Grenadines	392	25	36	19	0.36
49	Azerbaijan	57	3	8	0	0.37
50	Iran, Islamic Republic of	87	5	11	2	0.38
51	Vanuatu	236	15	23	10	0.39
52	Saint Kitts and Nevis	121	8	14	3	0.45
53	Algeria	74	6	9	1	0.60
54	Lebanon	58	5	8	0	0.63
55	Mongolia	44	4	6	0	0.64
56	Egypt	41	4	6	0	0.68
57	Switzerland	57	6	8	0	0.77
58	Cook Islands	297	26	29	13	0.84
59	Tunisia	30	4	5	0	0.84
60	Palau	187	18	19	7	0.89
61	Ukraine	83	10	10	1	0.98

Figure 33: Grey List (Paris MoU, n.d.)

RANK	FLAG	INSPECTIONS 2018-2020	DETENTIONS 2018-2020	BLACK TO GREY LIMIT	GREY TO WHITE LIMIT	EXCESS FACTOR
WHITE LIST						
1	Denmark	1,199	12	99	69	-1.80
2	Norway	1,559	18	126	92	-1.77
3	Marshall Islands	4,280	65	328	272	-1.72
4	Bermuda (UK)	169	0	18	6	-1.69
5	Netherlands	2,729	42	213	169	-1.68
6	Bahamas	1,851	27	148	111	-1.67
7	Greece	736	9	63	40	-1.63
8	Singapore	1,808	30	145	108	-1.59
9	Cayman Islands (UK)	410	4	38	20	-1.59
10	Japan	138	0	15	4	-1.54
11	Hong Kong (China)	1,741	31	140	104	-1.54
12	Liberia	4,017	89	308	254	-1.46
13	United Kingdom	922	17	78	51	-1.42
14	Malta	4,117	98	316	261	-1.40
15	Germany	570	10	50	29	-1.35
16	Turkey	732	14	63	39	-1.34
17	Italy	927	19	78	52	-1.34
18	Isle of Man (UK)	516	9	46	26	-1.32
19	Belgium	208	2	21	8	-1.30
20	Sweden	288	4	28	13	-1.26
21	Cyprus	2,018	53	161	122	-1.24
22	Barbados	399	7	37	19	-1.23
23	France	266	4	26	11	-1.16
24	Portugal	1,152	30	95	66	-1.16
25	Russian Federation	1,159	31	96	66	-1.13
26	Croatia	92	0	11	2	-1.07
27	Latvia	90	0	11	2	-1.04
28	Antigua and Barbuda	2,084	67	166	126	-1.02
29	Luxembourg	201	3	21	8	-0.99
30	Gibraltar (UK)	599	16	53	31	-0.97
31	Faroe Islands	245	5	24	10	-0.87
32	Ireland	144	2	16	5	-0.81
33	United States	194	4	20	7	-0.72
34	Lithuania	101	1	12	2	-0.66
35	Finland	404	13	37	19	-0.62
36	Spain	153	3	16	5	-0.60
37	Panama	5,754	275	435	370	-0.58
38	China	128	3	14	4	-0.26
39	Morocco	54	0	7	0	-0.22

Figure 34: White List (Paris MoU, n.d.)

2.17.5 THE LIST CONFIGURATION

"The performance of each flag is calculated using a standard formula for statistical calculations in which certain values have been fixed in accordance with agreed Paris MoU policy. Two limits have been included in the system, the 'black to grey' and the grey to white; limit, each with its own specific formula:

$$u_{black\_to\_grey} = N \cdot p + 0.5 + z\sqrt{(N \cdot p \cdot (1-p)}$$

$$u_{white\_to\_grey} = N \cdot p - 0.5 - z\sqrt{(N \cdot p \cdot (1-p)}$$

Figure 35: The list configuration (Paris MoU, n.d.)

N = Number of inspections,

p = The allowable detention limit, set to 7% by the Paris MoU PSCC

z = The significant requested (z=1.645 for statistically acceptance certainly level of 95%),

u = The allowed number of detentions for either the Black or White List.

To make the flags' performance comparable, the excess factor (EF) is introduced. Each incremental or decremental step corresponds with one whole EF-point of difference. The EF is an indication for the number of times the yardstick has to be altered and recalculated. Once the excess factor is determined for all flags, the flags can be ordered by EF. The excess factor can be found in the last column of the White, Grey or Black List. The target (yardstick) has been set on 7% and the size of the increment and decrement on 3%." (Paris MoU, n.d.)

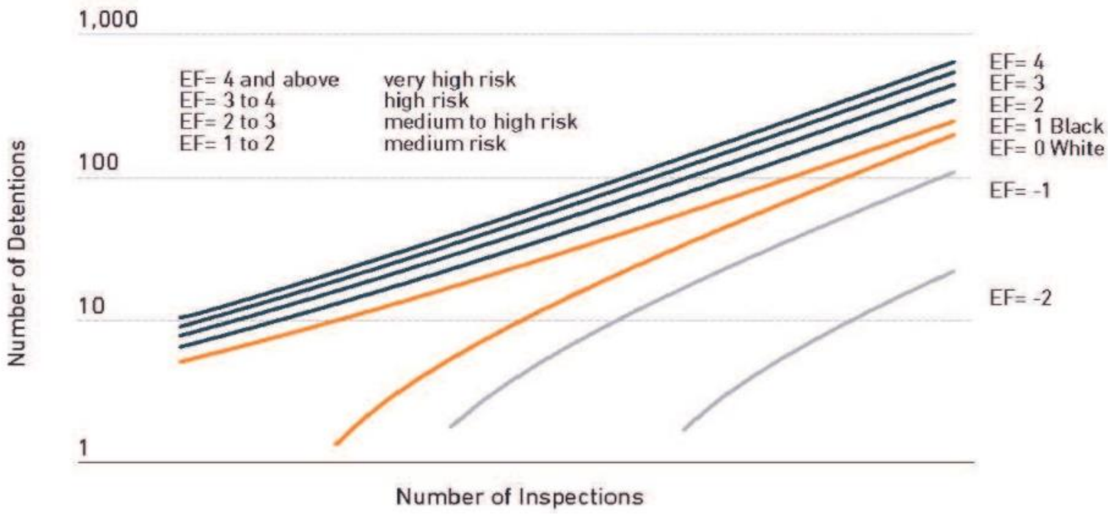


Figure 36: The relations between the number of inspected ships and the number of detentions (Paris MoU, 2021)

2.18 ANNUAL AND OCCASIONAL INSPECTIONS

2.18.1 DEFINITION OF ANNUAL INSPECTIONS

Annual inspections are taken by classification societies annually and are of high importance for the vessels operations, in order to meet the requirements and be complied with the international regulations. Many certificates require annual endorsement, after the completion of this process and after the surveyor ensuring that the desired level of safety is satisfied, the vessel is equipped with the appropriate machinery and tools, and then the certificates are endorsed for annual inspection. There are many kinds of annual inspections to be referred: International oil pollution prevention certificate inspection, Safety Radio Inspection, Safety equipment inspection etc. Many shipping professionals also consider the dry dock inspections as a kind of an annual inspection, in a more extensive form, during which the equipment and other operational aspects of the vessel are examined and verified. During an annual inspection the following items should be examined and verified, in order to determine if the ship is in the appropriate condition to meet the regulation requirements:

- Deck area structure
- Deck equipment and deck fittings
- Hatch covers access of the hatches
- Piping and supports
- Cargo holds and cargo tanks
- Voids and cofferdams
- Other accessible spaces

An annual inspection may long from several hours to some days to be completed. In case that the annual inspection is not completed in the inspection time window (it is the estimated time during which the inspection should be completed), then the class of the vessel is suspended. There is also a predetermined range of time when the annual inspection should be conducted. According to the current guidelines, the inspection should be completed at a time range from 3 months before the anniversary date to 3 months after the anniversary date. Upon completion of annual inspection, the vessel is ready to be subject to periodical inspections. Flag States that conduct annual inspections are the below:

- Bahamas
- Cyprus
- Liberia
- Malta
- Marshall Islands
- MPA Singapore
- Palau

- Panama
- St. Kitts & Nevis

2.18.2 BAHAMAS FLAG ANNUAL INSPECTION

Annual Inspections should be conducted after a 6-month period from the registry date, or 3-month prior or after the anniversary date. Its aim is to ensure that the safety, operation and maintenance standards are met, to monitor the audits and the statutory survey works. I case that the last 3 annual inspections are conducted by the same inspector, then a new inspector should be appointed to conduct the next inspection. Furthermore, if the annual inspection is not conducted within the time framework, then there will be a deficiency.

2.18.3 LIBERIA FLAG ANNUAL INSPECTION

All vessels that are registered to Liberian flag must conduct an annual inspection, except for vessels that have a cargo of less than 500 tons, or unmanned barges etc.

2.18.4 MARSHALL ISLANDS FLAG ANNUAL INSPECTION

Annual Inspections should be conducted in a period that does not exceed the one year, except for vessels that have a cargo of less than 400 tons, unmanned barges, yachts, vessels during a lay-up period, and vessels under construction.

2.18.5 MPA SINGAPORE FLAG ANNUAL INSPECTION

According to the authorities' guidelines, some of the minimum tasks that should be completed during the annual inspection held by Singapore Flag State are: protected space should be inspected to confirm that there are not any modifications, which would change the effectiveness of the system, all the containers should be inspected in order to be ensured that no damage has been provoked, and finally the manifold should also be inspected to confirm that all the corresponding equipment is in place. Furthermore, these inspections focus on more specific equipment, like fire mains, hoses and fire pumps.

2.18.6 PALAU FLAG ANNUAL INSPECTION

All the vessels that are registered to this flag, should be subject to an annual inspection so as to be verified that the vessel operates according to the flag's requirements and regulations. All the annual inspections should be conducted at a time window of 3 months of prior or after the anniversary date, as previously it has been referred to the definition of annual inspection. Especially, for ships that have been recently registered to the flag, the annual inspection should be conducted not later than a period of 3 months after the vessel's registration,

2.18.7 PANAMA FLAG ANNUAL INSPECTION

Annual Inspections for vessels that are registered to Panama flag, must be undertaken only by specialized and experienced inspectors, authorized by Panama Administration and coordinated also by the respective Maritime Safety Department. However, these vessels are subject to occasional inspections, in case that some of the requirements of the flag are not satisfied. All the relevant personnel, like the Master, the charterer's representatives, the agents and company's representatives, should allow the flag inspectors to complete the process without disrupting it, and are obligated to cooperate with them in order the process to be completed. Consequently, if the Master or the shipowner refuses or does not let the inspection to completed, then there is a cash penalty of ten thousand dollars approximately. On some occasions, that the disruption of inspection process is reoccurred, then further to the cash penalty, there is a cancellation from the flag's registry, or the vessel may be subject to a detention by the local authorities. Panama authorities have also established special requirements for vessels that transit to Panamanian ports or terminals from specific countries. An example of these countries is United States of America. When a vessel transits from Panama to USA, and is registered to the Panamanian flag, is obligated to conduct an annual safety inspection, prior to its arrival to USA. This new requirement has been imposed to the regulations, as an increase to the deficiencies has been recently identified and this issue has contributed to an increase to the detention by the American authorities. The deficiencies, of these cases, are related mainly with the lack of expertise, knowledge and experience of the crew, provided during the inspection, to handle the vessel's equipment.

2.18.8 ST. KITTS & NEVIS FLAG ANNUAL INSPECTION

According to the flag's requirements, the established regulations have determined and described a specific category of vessels that should conduct annual inspections. These types include vessels with an age of over 30 years, which are trading with Paris MOU, vessels which have been detained within the last 12 months or have been detained twice within a period of the last 24 months and are irrespective of the PSC MOU and previous Flag state accordingly. In addition, in this category the vessels which intend to trade with Paris MOU and have not registered for a period of the last 12 months, are also included. If the vessel fails to conduct the annual inspection, then the flag administration may impose a penalty, for non compliance with the regulations. In more extreme occasions, the vessels may also be subject to detention by the authorities. Adjustment of the scheduled inspection dates are permitted, while the postponement of an annual inspection is not permitted. It must also be referred that if a vessel's performance during an inspection is evaluated as "good" or is classified with a higher grade, then a wider time frame is provided which is extended to 16 months. However, if a new deficiency is identified or the vessel is detained during this extended period, then the time frame is adjusted and is equal to the inspection time frame, that was set before the upgrade of the vessel's performance.

2.19 DEFINITION OF OCCASIONAL INSPECTIONS

Occasional Inspections are conducted when an unexpected failure, problem or event that create imbalances in the operations of the vessels. Examples of unexpected failures may be: damage provoked to the machinery, to the equipment or the hull, due to the bad weather, or disruptions of loading – unloading operations. Occasional inspections should also be conducted in special cases. Examples of these cases are detentions by the corresponding port authorities, increase in the number of personnel on board or when the shipping company is not able to meet the requirements and the regulations of the flag state. In addition, an occasional inspection is undertaken, when new requirements are introduced into the current regulations, when significant changes are made to the equipment, the machinery, or the design of the hull, without the approval of the relevant Registry authorities and when there is a change in the ownership, the name of the shipping company or the vessel's registered flag. Finally, the flag states should inspect periodically the registered vessels, in order to ensure that the requested certificates are in place and keep up with the current situation of the vessel. Occupational inspections are also undertaken before the vessel is accepted by the corresponding Registry. Some of the flag states that conduct occasional inspections are: Cyprus, Cayman Islands, Bahamas, St. Kitts & Navis, Panama. Below is analyzed an example of Cypriot flag occasional inspection.

2.19.1 CYPRUS FLAG OCCASIONAL INSPECTIONS

Cypriot flag inspections are divided into two categories: the entry inspections and the occasional inspections. Occasional inspections are undertaken when there is an official approval by the Shipping Deputy Ministry of Cyprus. When only the written and detailed authorization of the authorities is provided to the inspectors, then the process of the inspection may commence. Many factors determine when an occasional inspection should commence and must be taken into consideration, like the safety record of the vessel, how many detentions have been occurred for this vessel by other port state authorities, and which are the deficiencies (their nature, the number, if they have been reoccurred etc.) that are identified during a port state control inspection.

CHAPTER 3: PORT STATE CONTROL

(Edited by Eirini Chounta)

3.1. PORT STATE CONTROL

“Port State Control is the inspection of foreign ships in national ports to verify that the condition of the ship and its equipment comply with the requirements of international regulations and that the ship is manned and operated in compliance with these rules.” (IMO, 2021)

The resolution A.682 which concerns the regional cooperation in ship control has, as a result, the conclusion of regional agreements. For the purpose of improving the situation of Port State Control inspections, Europeans were the pioneers who added an extent about marine safety. The first Memorandum of Understanding (MoU) on Port State Control (PSC) is the Paris MoU and was established in Europe in July 1982. The basic idea of Port State Control is that the Port Authorities, each country, has the legal right to inspect the mooring foreign ships and to ensure that they do not pose a threat. These inspections function as a “safety net” to detect substandard ships. Also, the International Maritime Organization (IMO) and the International Labor Organization (ILO) offer their valuable help and they prompt more regions to create more MoUs worldwide. Thus, based on this extension the Port State Control standards become tightened. With the proper coordination will be avoided unnecessary inspections. However, this ensures that a large number of ships are inspected and there are not any kind of delays in ports.

Figure 37: Port State Control Inspection (SAFETY4SEA, 2017)

3.2. HISTORICAL DEVELOPMENT

During 1967 a shipping accident created a lot of concerns about environmental pollution globally. On 18 March 1967, the tanker named Torrey Canyon released 110,000 tons of crude oil into the sea, at the western coast of Cornwall in England. It was the largest vessel that had ever sunk, and it was causing a devastating environmental accident. After all this public shock, in a period of two years later, the governments all around the world decided, agreed and signed the International Convention on Civil Liability for Oil Pollution Damage. The end-all was to prevent similar future accidents which will produce irreparably problems in the shipping industry. Regrettably, in March 1978, the supertanker "Amoco Cadiz", operating under the Liberian flag of convenience, ran aground on Portsall Rocks, 1 mile away from the British and French coasts. The crude oil which spilled out was more than 220,000 tons. The ship split in three and sank, creating the largest oil spill in history to that date. The environmental disaster and the effects on the sea and humans shocked public opinion. Moreover, the accident had an important impact on national economies. In 1992, Amoco agreed to pay 230 million US dollars. It is becoming obvious that this event has affected many important sectors besides the environment. First of all, the shipowner loses the ship or he needed to fix the damages for the purpose of reintroduction in the market. Secondly, the accident causes a big cost for putting the oil slick under control and restoring the environment. Last but not least, these kinds of events author various problems in human health. According to all these information and experiences, it can be proved that these tragic accidents have serious affects not only on nature but also in humanity and the national economies. We could emphasize that the national economies need inestimable time to recover but the environment needs imponderable years.

Today, the regime of Port State Control has adopted and has enforced seven of the most important conventions which are the International Convention for the Safety of Life at Sea (SOLAS), the International Convention for the Prevention of Pollution from Ships (MARPOL), the International Convention on Load Lines (LOADLINES), the International Convention on Standards of Training, the Certification and Watchkeeping for Seafarers (STCW), the Convention on the International Regulations for Preventing Collisions at Sea (COLREG), the International Convention on Tonnage Measurement of Ships (TONNAGE) and the Merchant Shipping Convention (ILO 147). All these regulations were implemented due to the belief that many flag states are not reliable to ensure that the ships which have their flags are complying completely with the international safety standards under the auspices of the International Maritime Organization (IMO) and the International Labor Organization (ILO). The Port State Control and all these conventions are operating in addition and are here to stay for a better future.

After the “Amoco Cadiz” incident the public insists on stricter regulatory measures for all ships. The January of 1982 fourteen European countries took a significant decision to sign the Memorandum of Understanding on Port State Control in Paris. The MoU embodied main measures about the safety of life at sea. Moreover, the prevention of pollution by ships, and a code of living and working conditions on board ships have the same importance. This successful implementation motivated and other countries around the world to create several regional agreements. Presently, there are nine MoUs and the United States MoU compose the tenth Port State Control regime. First, is the Paris MoU(Europe and the North Atlantic region), the Tokyo MoU(Asia and the Pacific region), the Abuja MoU(West and Central Africa region), the Black Sea MoU(Black Sea region), the Caribbean MoU(Caribbean region), the Indian Ocean MoU(Indian Ocean region), the Mediterranean MoU (Mediterranean region), the Riyadh MoU(the Kingdom of Bahrain, State of Kuwait, Sultanate of Oman, State of Qatar, Kingdom of

Saudi Arabia and United Arab Emirates), the Acuerdo de Vina del Mar MoU(Latin America region) and the last one the United States Coast Guard.

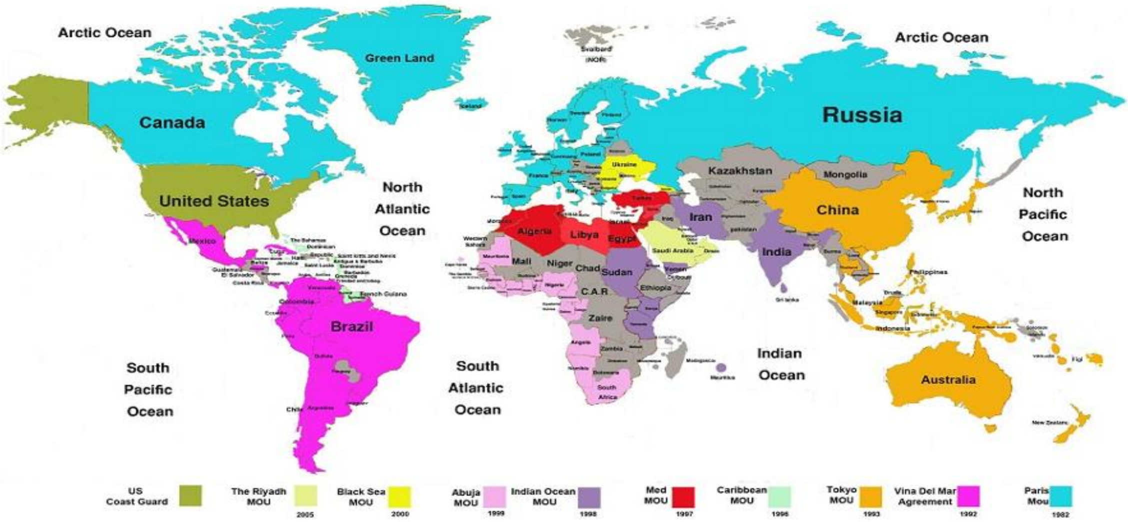


Figure 38: Map of MoU areas (T-StarMET Ltd., n.d.)

3.3. PORT STATE CONTROL AND REGIONAL MOUS

3.3.1 PARIS MOU

In 1978, many European countries encountered at Hague, and they created an agreement about a memorandum that agreed to check whether the working conditions on the ships were following the rules of the International Labor Convention (ILO). After the sinking of the "Amoco Cadiz," there was a need for new measures about safety and pollution. In 1982, agreed and signed the Paris Memorandum of Understanding (Paris MoU). Its main purpose was to underline that the maritime safety and the protection of the marine environment should increase significantly and, also, should upgrade the living and working conditions on board ships. The organization is composed of 27 participating maritime Administrations. Its scope covers the waters of the European coastal States and the North Atlantic basin from North America to Europe. In essence, this was caused by the failure of flag states, in particular flags of convenience which have their work to classification societies, to comply with the tasks of their inspections. The member states of the Paris MoU are Belgium, Bulgaria, Canada, Cyprus, Croatia, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, The Netherlands, Norway, Poland, Portugal, Romania, the Russian Federation, Spain, Slovenia, Sweden, and the United Kingdom.

Each authority must apply the provisions of the Agreement and the Annexes. Secondly, it must maintain an effective port state control system for foreigners' boats moored or sailing in a state port or offshore facilities to comply with the international standards, without discrimination as to the flag. Thirdly, it must exchange information and consult, if necessary, the other authorities in order to achieve the objective of the Agreement and lastly it must establish, independently or with help, appropriate procedures to guide services and port authorities to inform the competent Port State Authority of any deficiency is identified which may threaten the safety of the vessel or can pose a threat to the marine environment. Also, a secretariat exists and is supported by the Netherlands' Ministry of Infrastructure and Water Management and its scope is to support the committee and ensure the effectiveness of the Memorandum.

The states that adopt the Paris Protocol have agreed to inspect 25% of foreign-flagged ships entering their ports each year. They set up a permanent secretariat to coordinate all the national activities and to admit each authority to a regional database. In case that a vessel is inspected in a country that complies with all Paris MoU commitments, then there is no need for that vessel to be inspected again in the next country which will be moored. The Port State Control should focus on ships that have not been inspected. The responsibility for the ship's compliance with the requirements rests with the shipowner, but the duty for checking this obedience always remains on the flag ships.

"Paris Memorandum of Understanding consists of 12 annexes which are:

- Annex 1 Ships of non-Parties and below convention size
- Annex 2 No longer use
- Annex 3 Information System on Inspections
- Annex 4 Publication of Information Related to Detentions and Inspections
- Annex 5 Qualitative Criteria for Adherence to the Memorandum
- Annex 6 Minimum Criteria for Port State Control Officers
- Annex 7 Ship Risk Profile
- Annex 8 Inspection and Selection Scheme
- Annex 9 Inspection Type and Clear Grounds
- Annex 10 Examination of certificates and documents
- Annex 11 Inspection Commitments of Authorities
- Annex 12 Reporting obligations for ships" (Paris MoU, n.d.)

Annex 7 of the memorandum analyzes very well the Ship Risk Profile (SRP). This SRP plays a vital role because it determines the ship's priority for inspection, the period between the inspections, and also, the inspections' spectrum. The tactic of calculation, furthermore as criteria used are similar altogether regional agreements.

Ship Risk Profile

Firstly, the information system categorizes ships into high, low and standard risk according to their characteristics which are calculated on a daily basis. Each criterion is proportional to weighting points. Thus, ships that gather more than 5 weighting points are considered high risk. In contrast, ships that meet the low-risk criteria and have carried out at least one inspection in the previous 36 months are considered low-risk. Standard risk ships are neither HRS nor LRS. After every inspection follows a recalculation. Moreover, it is important to note that inspection is necessary when changing the tables of classification society and flags.

				Profile			
				High Risk Ship (HRS)		Standard Risk Ship (SRS)	Low Risk Ship (LRS)
Generic Parameters				Criteria	Weighting points	Criteria	Criteria
1	Type of ship			Chemical tanker Gas Carrier Oil tanker Bulk carrier Passenger ship NLS-tanker	2	neither a high risk nor a low risk ship	All types
2	Age of ship[1]			all types > 12 y	1		All ages
3a	Flag	BGW-list[2]		Black - VHR, HR, M to HR	2		White
				Black – MR	1		
3b		IMO-Audit[3]		-	-		Yes
4a	Recognized Organization	Performance[4]	H	-	-		High
			M	-	-		-
			L	Low	1		-
			VL	Very Low			-
4b		Organizations recognized by one or more Paris MoU Member States		-	-		Yes
5	Company	Performance[5]	H	-	-		High
			M	-	-		-
			L	Low	2		-
			VL	Very Low			-
Historic Parameters							
6	Number of def. recorded in each insp. within previous 36 months	Deficiencies		Not eligible	-		≤ 5 (and at least one inspection carried out in previous 36 months)
7	Number of Detention within previous 36 months	Detentions		≥ 2 detentions	1		No Detention

[1] according to point 9 of this Annex
[2] according to formula in the Annual Report
[3] according to point 11 of this Annex
[4] according to formula in the Annual Report
[5] according to point 15 of this Annex
Including 43[rd] Amendment, adopted 2 October 2020 (effective date: 1 January 2021)

Figure 39: Ship Risk Profile of Paris MoU (Paris MoU, n.d.)

There are plenty of parameters for Ship Risk Profile which are namely: the type of ship, the age of the ship, the Black, Grey, and White list which is an annual procedure that pays attention to the ship's detention history over the previous three calendar years, the IMO audit, the recognized organization performance, the company performance, the deficiency index, the detention index, and the company performance matrix.

Specifically, the company performance examines in detail a company's detention and deficiency history. Companies are categorized as "very low", "low", "medium" or "high" depending on their performance. The calculation is presented on a daily basis of a running 36-month period. There is no limit for the number of inspections required to qualify. The exception is the company that hasn't got any inspection in the last 36 months. Thus, it will have a “medium performance. Also, the deficiency index concerns the fleet of the whole company and is the ratio of the total points of all deficiencies of all ships. Deficiency about the ISM count 5 points whereas other deficiencies are valued 1 point. Depending on the number of detentions of the ship, the criterion can be taken from 0 to 1 point, with the number 1 making the criterion more dangerous. Finally, the degree of danger of the ship and its characterization in HRS, SRS, or LRS is determined by the sum of the points. If it is from 5 and above, the ship enters in the category of high risk, and they are called High-Risk Ships (HRS). The detention index works accordingly.

deficiency index	deficiency points per inspection
above average	> 2 above PMoU average
average	PMoU average ± 2
below average	> 2 below PMoU average

detention index	detention rate
above average	> 2 above PMoU average
average	PMoU average ± 2%
below average	> 2 below PMoU average

Figure 40: Deficiency and detention index of Paris MoU (Paris MoU, n.d.)

The Low-Risk Ships (LRS) have some characteristics. First, they do not belong to the types of ships that are considered dangerous. Second, the flag, the certifying organization, and the shipping company have excellent classification. Third, the ship has less than 5 observations in the last 36 months inspection and the ship has not had any detention for the last 36 months. Ships that do not fall into the above two categories are considered ships Standard Risk Ships (SRS).

Moreover, the company performance index is a combination of deficiency and detention indices.

Detention Index	Deficiency Index	Company Performance
above average	above average	very low
above average	Average	low
above average	below average	
average	above average	
below average	above average	
average	Average	medium
average	below average	
below average	Average	
below average	below average	high

Figure 41: Company Performance Index of Paris MoU (Paris MoU, n.d.)

Inspection and Selection Scheme

Annex eight is detailed the Ship's Risk Profile and periodic inspections have an important role on it. Moreover, an additional inspection may be the result of overriding or unexpected factors, and it is important to mention that these factors are contained and applied in the nine memoranda, respectively.

"Overriding Factors

- Ships reported by another Member State or the secretariat excluding unexpected factors,
- Ships involved in a collision, grounding, or stranding on their way to the port,
- Ships accused of an alleged violation of the provisions on the discharge of harmful substances or effluents,
- Ships that have been maneuvered in an erratic or unsafe manner whereby routing measures, adopted by the IMO, or safe navigational practices and procedures have not been followed,
- Ships that have been suspended or withdrawn from their Class for safety reasons after the last PSC inspection,
- Ships which cannot be identified in the database."

Unexpected Factors

They could pose a serious threat to the ship, the crew, and the environment. The additional inspection is about the assessment of the Authority.

- "Ships reported by pilots or relevant authorities which may include information from Vessel Traffic Services about ships' navigation,
- Ships which did not comply with the reporting obligations,
- Ships reported with an outstanding ISM deficiency,

- Previously detained ships,
- Ships which have been the subject of a report or complaint by the master, a seafarer, or any person or organization with a legitimate interest in the safe operation of the ship, ship on board living and working conditions or the prevention of pollution, unless the Member State concerned deems the report or complaint to be manifestly unfounded,
- Ships operated in a manner to pose a danger,
- Ships reported with problems concerning their cargo, in particular noxious or dangerous cargo,
- Ships where information from a reliable source became known, that their risk parameters differ from the recorded ones and the risk level is thereby increased,
- Ships carrying certificates issued by a formerly Paris MoU recognized organization whose recognition has been withdrawn since the last inspection in the Paris MoU region." (Paris MoU, n.d.)

It should be noted that these overriding and unexpected factors are also implemented by other MoUs as Tokyo, Abuja, and Black Sea MoUs and are not repeated in the rest of the dissertation.

Additionally, periodic inspections take place for HRS between 5-6 months, for SRS between 10-12 months, and for LRS between 24-36 months. After the last additional inspection, the next inspection will be periodic. The selection scheme is divided into two priorities: Priority I and Priority II. If the ship has not been inspected by a PSCO in the provided time or this comes to an end, this ship is immediately put in the first priority category for inspection, otherwise, it is in the second priority (Priority I / Priority II). Sometimes Priority II doesn't take place but, in this case, the ship remains Priority II until this time expires.

Priority	Level	Category of inspection
I **Ship must be inspected**	Overriding factor	Additional
	HRS not inspected in last 6 months	Periodic
	SRS not inspected in last 12 months	Periodic
	Ship not inspected in last 36 months	Periodic
II **Ship may be inspected**	HRS not inspected in last 5 months	Periodic
	Ship with unexpected factors	Additional
	SRS not inspected in last 10 months	Periodic
	LRS not inspected in last 24 months	Periodic

Figure 42: Table of Priority of Paris MoU (Paris MoU, n.d.)

Paris MoU decided to adopt the new regime called NIR. The committee meeting took place in Reykjavik, Iceland (May 2009). NIR was developed by a working group led by the EU. The real leadership of this special team was assigned to EMSA. NIR doesn't base on the 25% individual quota. The current fair system of participation is the ratio of individual arrivals in a Member State to the arrivals of that ship in all Member States. A key element in implementing NIR is the recording of arrival information at the port. This arrival information at the port is also important for scheduling inspections and resources from the Member States. Arrival information at the port was initially recorded from the Member State to a SafeSeaNet and then transferred to the new Port State Control (PSC) database. This database called THETIS replaced the previous Sirenac system and was managed by EMSA. Based on this, ships are categorized into three risk profiles. Depending on their risk profile, the frequency of PSC inspections is also determined. On the web Paris MoU site, free computing software is available to help managers assess the performance of their ships and their company.

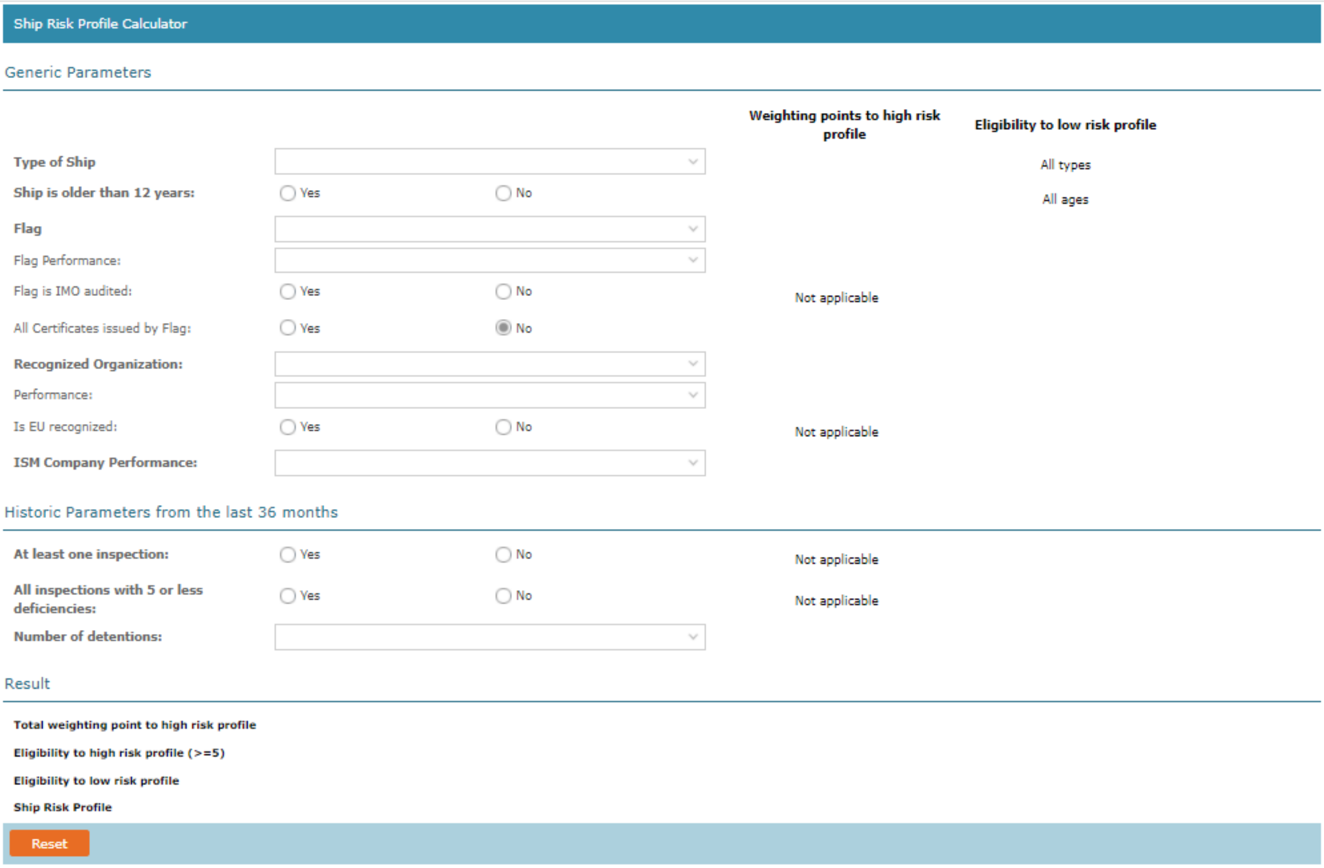


Figure 43: Ship Risk Profile Calculator (Paris MoU, n.d.)

Reporting obligations for ships

A crucial part of Port State Control is the reporting obligation which is divided into three categories. The first category is the 72-hour message (72 ETA). If a ship has been chosen to an expanded inspection, then it is required to report 72 hours before arriving at a port or anchorage of the specific region. If the voyage duration is less than 72 hours, the master should inform the Authorities of the next port before leaving the previous port or anchorage. For this procedure is required some information which includes the ship's identification namely the IMO number and the name, the call sign, and the MMSI number. Also, it is required the port of destination, the ETA, the ETD, the extent of the call, the date of the last expanded inspection in this region, and if the vessel has any operation, survey inspections, and maintenance in the port of destination. Especially, in the tanker's case is important to mention the configuration, the condition of the cargo, the volume and the nature of the cargo and the ballast tanks Secondly, there is a 24-hour message (24 ETA). In this case, the master or the agent has the obligation to notify the Member States to which it is destined 24 hours before the arrival of the ship. In other cases, if the voyage lasts less than 24 hours then the master must notify the moment that the ship leaves the previous port. The required information is the ship's identification, the port of destination, the ETA, and the ETD. Third, is the actual arrival message (ETD) in which Member States report the actual time of arrival of any calling at Member States ports and the last one is the actual departure message (ATD) which is the actual time of departure, respectively.

3.3.2 TOKYO MOU

"The Tokyo Memorandum of Understanding includes the Asia and Pacific region and consists of 21 full members which are: Australia, Canada, Chile, China, Fiji, Hong Kong, Indonesia, Japan, Republic of Korea, Malaysia, Marshall Islands, New Zealand, Panama, Papua New Guinea, Peru, Philippines, Russian Federation, Singapore, Thailand, Vanuatu, and Vietnam. The Tokyo MoU was signed on 1 December 1993 and applied on 1 April 1994 in Tokyo." (Tokyo MoU, n.d.)

The main purpose is the same as the Paris MoU and that is the inspection on substandard, unseaworthy ships so as to increase the maritime safety, to protect the marine environment, and to provide better working and living conditions for seafarers on board ships. In order not to have observations during the inspections the ship should be complied with safety and prevention requirements for pollution on board, as mentioned above. Compliance can be achieved with the successful implementation of a safety management system including preventive maintenance. A Committee of the Port Authority has been set up consisting of representatives from each of the authorities of the memorandum states. A representative from each of the cooperating authorities States and Observers will be inclined to participate without the right to vote on work of the Commission.

The Committee has some responsibilities. Firstly, it has specific duties to conduct on the basis of the memorandum as it should develop and review guidelines for carrying out inspections. Secondly, it should be occupied with the coordination of procedures, practices and performance relating to inspection. Moreover, it should develop and analyze procedures for the exchange of information and the last is to attend to all topics relating to the operation and the effectiveness of the memorandum. Additionally, the committee’s target is to manage a regional annual inspection rate of 80% of the total number of ships that entered in the region in a specific time window.

In addition to the 21 country members mentioned above, Tokyo MoU consists of the following collaborating members. A cooperating Member State Authority in Peru, 4 Observer Authorities such as Macao (China), Democratic People’s Republic of Korea, Islands Solomon and United States Coast Guard (USCG) and 6 observer organizations: the International Maritime Organization (IMO), the International Labor Organization (ILO). The Paris Memorandum (Paris MoU), the Black Memorandum Sea, the Indian Ocean Memorandum (Indian Ocean MoU), and the Vina del Mar Agreement.

For the proper implementation of Port State Control of Tokyo MoU, created the Asia-Pacific Computerized System (APCIS).

New Inspection Regime (NIR)

The new inspection regime (NIR) implemented in Tokyo MoU from 1 January 2014. A big spectrum of certain criteria which are called overriding priority determine which ships could be selected for an inspection. Firstly, another Authority may ask for the inspection and secondly, the Master or a crew member or any person or organization can complain due to the unsafe operation of the ship, shipboard living and working conditions, or the prevention of the pollution. There is, of course, the case the competent authority considers that the report or complaint cannot be supported and proved. Thirdly, when a ship has left a port but has some deficiencies which need to be rectified at a specific time. For example, ships that have been reported by pilots or port authorities as deficient endanger their safe navigation. Moreover, ships that didn’t report all information about their cargo because they carry dangerous or polluting goods and the last is the category of ships identified by the Committee occasionally as warranting priority inspections.

The Port State Control Inspections are based on the Ship Risk Profile standard, following the NIR. This will determine the priority for inspection and the period for the inspection. Tokyo MoU has many similarities with the Paris MoU.

Ship Risk Profile

According to APCIS, ships are categorized as high, low risk and standard. High-Risk Ships (HRS) are characterized by those that accumulate more than 4 weighting points, Low-Risk Ships (LRS) are ships that have the LRS characteristics and have an inspection in the previous 36 months. Ships that are neither LRS nor HRS are characterized as Standard Risk Ships (SRS).

Parameters		Profile			
		High Risk Ship (HRS) (When sum of weighting points >=4)		Standard Risk Ship (SRS)	Low Risk Ship (LRS)
		Criteria	Weighting points	Criteria	Criteria
Type of Ship		Chemical tanker, Gas Carrier, Oil tanker, Bulk carrier, Passenger ship, Container ship	2	Neither LRS nor HRS	-
Age of Ship		All types > 12y	1		-
Flag	BGW-list[1]	Black	1		White
	IMO Audit[2]	-	-		Yes
Recognized Organization	RO of Tokyo MOU[3]	-	-		Yes
	Performance[4]	Low Very Low	1		High
Company performance[5]		Low Very Low No inspection within previous 36 months	2		High
Deficiencies	Number of deficiencies recorded in each inspection within previous 36 months	How many inspections were there which recorded over 5 deficiencies?	No. of inspections which recorded over 5 deficiencies		All inspections have 5 or less deficiencies (at least one inspection within previous 36 months)
Detentions	Number of Detention within previous 36 months	3 or more detentions	1		No detention

Figure 44: Ship Risk Profile of Tokyo MoU (Tokyo MoU, n.d.)

For Low-Risk Ships (LRS) the time window for the periodic inspection is 9 to 18 months, for Standard Risk Ships (SRS) is 5 to 8 months and for High-Risk Ships (HRS) is 2 to 4 months. The APCIS information system shows for each ship and the priority which is divided into two priorities I and II just like in Paris MoU.

3.3.3 ABUJA MOU

One of the regional MoU on Port State Control adopted on the basis of IMO Resolution A.682 (17) of 1991 is that of the Abuja's which includes the region of West and Central Africa. It was established on 22nd October 1999 and composed of the Marine Administrations of countries abutting the Atlantic coast of Africa. The organization operates under a Cooperative Agreement with the IMO. Abuja MoU consists of 13 full members which are Angola, Benin, Congo, Cote d'Ivoire, Gabon, Ghana, the Gambia, Guinea, Nigeria, Sao Tome and Principe, Sierra Leone, Senegal, and Togo. Some countries have signed the Memorandum, but they have not accepted yet and these are: Cameroun, Cabo Verde, Democratic Republic of Congo, Guinea Bissau, Equatorial Guinea, Liberia, Mauritania, Namibia, and South Africa.

The Abuja's observers are Mali, Burkina-Faso, Paris MoU, Tokyo MoU, Indian Ocean MoU, Caribbean MoU, Mediterranean MoU, Black Sea MoU, Riyadh MoU, Latin America Agreement, Maritime Organization of West and Central Africa, IMO, ILO, the Food and Agricultural Organization, the Asia-Pacific Maritime Information and Advisory Services of the Russian Federation. There is, also, a secretariat who is a member of the Bureau. The Abuja MoU Bureau consists of Ministers from 5 member States in this specific region. The Bureau, also, gives the directions to the Committee.

This Memorandum contains 13 Annexes and, in this chapter, annexes 7 and 8 will be mentioned briefly because there are many similarities with the Paris MoU.

- "Annex 1 Ships of non-Parties and below convention size
- Annex 2 ILO Maritime Labor Convention 2006
- Annex 3 Information System on Inspections
- Annex 4 Publication of information related to detentions and inspections
- Annex 5 Membership of Memorandum
- Annex 6 Minimum criteria for PSCOs
- Annex 7 New inspection regime
- Annex 8 Inspection and selection scheme
- Annex 9 Inspection type and clear grounds
- Annex 10 Examination of certificates and documents
- Annex 11 Inspection commitments and authorities
- Annex 12 Reporting obligations for ships
- Annex 13 Members and dates of accession"

(Abuja MoU, n.d.)

Ship risk profile

The AMIS database (Abuja database) categorizes the ships at High-Risk Ships (HRS) with a total value of 4 or more points, at Low-Risk Ships (LRS) which have a minimum of one inspection in a time window of 36 months, and at Standard Risk Ships (SRS). In this region, there is no age limitation for the ships. Only vessels over 12 years of age will have an expanded inspection. The criteria for ship's risk profile are presented in the table below.

Parameters				Profile			
				High Risk Ship (HRS) (When sum of weighting points >=4)		Standard Risk Ship (SRS)	Low Risk Ship (LRS)
Generic Parameters Criteria				Criteria	Weighting points	Criteria	Criteria
1	Type of ship			Chemical tanker Gas Carrier Oil tankship Bulk carrier Passenger ship, Container ship	2	Neither a high risk or a no risk ship	All types
2	Age of ship			all types > 12 years	1		All ages
3	Flag	BGW-List[1]		Black – VHR, HR, MR	1		White
		IMO Audit[2]		-	-		Yes
4	Recognized Organizations	Performance[4]	H	-	-		High
			M	-	-		
			L	Low	1		-
			VL	Very Low			-
		ROs recognized by 1 or more AMoU members[4]		-	-		Yes
5	Company Performance[5]		H	-	-		High -
			M	-	-		
			L	Low	2		
			VL	Very Low No inspection within previous 36 months			
Historic Parameters							
6	Deficiencies	No of deficiencies recorded in each inspection within previous 36 months		How many inspections were there which recorded over 5 deficiencies?	No. of inspections which recorded over 5 deficiencies		All inspections have 5 or less deficiencies (and at least one inspection carried out within previous 36 months)
7	Detentions	Number of Detention within previous 36 months		3 or more detentions detentions	1		No Detention

Figure 45: Ship Risk Profile of Abuja MoU (Abuja MoU, n.d.)

Selection Scheme

Periodic inspections are carried out at intervals determined by the ship risk profile and the ships become in need of periodical inspection in the following time windows. The selection scheme is the same as the Paris MoU.

Ship Risk Profile	Time Window since previous inspection in the Abuja MoU Region
Low Risk Ships	9 to 18 months
Standard Risk Ships	5 to 8 months
High Risk Ships	2 to 4 months

Figure 46: Time window of Abuja MoU (Abuja MoU, n.d.)

3.3.4 BLACK SEA MOU

The Black Sea Memorandum of Understanding was filled and signed in Istanbul in Turkey on 7 April 2000 and there are 6 members which are the republic of Bulgaria, Romania, Georgia, the Russian Federation, the Republic of Turkey, and Ukraine.

There are also observers which are Paris MoU, Tokyo MoU, the Indian Ocean MoU Mediterranean MoU, and Vina Del Mar Agreement. It has been noticed that Bulgaria, Romania, and Russian Federation are members and, in the Paris MoU, and the Russian Federation is a member of the Tokyo MoU. The Committee consists of representatives of each of the Authorities, one of the ILO and one of the IMO. Also, the secretariat is in Istanbul.

"The Committee will monitor the overall inspection activity and its effectiveness throughout the region, aiming for a regional annual inspection rate of 75% of the total number of individual ship visits in the region. At this Memorandum there are 8 annexes which are:

- ❖ Annex 1 Ships of non-Parties and below convention size
- ❖ Annex 2 Maritime Labour Convention
- ❖ Annex 3 Inspection Type and Clear Grounds
- ❖ Annex 4 Ship Risk Profile
- ❖ Annex 5 Inspection and Selection Scheme
- ❖ Annex 6 Minimum Criteria for PSCOs
- ❖ Annex 7 Terms of Reference of the Secretariat
- ❖ Annex 8 Qualitative Criteria for Adherence to the Memorandum"

(Black Sea MoU, n.d.)

Ship Risk Profile

The Black Sea MoU has an information database called BSIS from which it derives all the data about the ships. Ships are categorized as high, standard, and low risk based on historic and generic parameters. High-Risk Ships (HRS) are ships with a total value of

5 or more weighting points, Low-Risk Ships (LRS) adopt the LRS parameters and have had at least one inspection in the previous 36 months and Standard Risk Ships (SRS) are neither LRS nor HRS.

Parameter		Profile: High Risk Ship (HRS) When sum of the weighting points ≥5 – Criteria	Weighting Points	Standard Risk Ship (SRS) – Criteria	Low Risk ship (LRS) – Criteria
Type of Ship		Chemical tanker Gas Carrier Oil tanker Bulk carrier Passenger ship Ro-Ro cargo ship	1	Neither LRS nor HRS	-
Age of Ship		All types >12 ≤ 24 y	1		-
		All types ≥25 y	2		-
Flag	**Detention Index**[1]	High	1		-
		Very High	2		-
	Deficiency Index[2]	-	-		Low
	IMO-Audit[3]	-	-		Yes
Recognized Organization	**RO of BS MOU**[4]	-	-		Yes
	RO related Detention Index[5]	High	1		-
	RO related Detainable deficiency Index[6]	-	-		Low
Company	**Detention Index**[7]	High	2		-
	Deficiency Index[8]	-	-		Low
Ship Historic Parameters – Detentions	Number of detentions within previous 36 months	2 detentions	1		No detention
		3 or more detentions	2		
Ship Historic Parameters – Deficiencies	**Deficiency Index**[9]	Very High	1		Low

Figure 47: Ship Risk Profile of Black Sea MoU (Black Sea MoU, n.d.)

Selection Scheme

There are overriding and unexpected factors that may cause an additional inspection. This kind of inspection is taken place between the periodic inspections. In the Black Sea MoU region, the time windows for the periodic inspection for High-Risk Ships are between 2-4 months, for Standard Risk Ships are between 5-8 months and for Low-Risk Ships are between 9-18 months, after the last inspection. In this memorandum ships, also, will be selected based on priorities.

Priority	Level	Category of inspection
I **Ship must be inspected**	Overriding factor	Additional
	HRS not inspected in last 4 months	Periodic
	SRS not inspected in last 8 months	Periodic
	Ship not inspected in last 18 months	Periodic
II **Ship may be inspected**	HRS not inspected in last 2 months	Periodic
	Ship with unexpected factors	Additional
	Overriding factor Ship becomes priority I	Additional
	SRS not inspected in last 5 months	Periodic
	LRS not inspected in last 9 months	Periodic
Ship with no priority (ships with neither Priority I nor Priority II)	Overriding factor Ships become Priority I Unexpected factor Ships become Priority II	Additional

Figure 48: Table of Priority of BS MoU (Black Sea MoU, n.d.)

In the case of Unexpected Factors, the necessity of additional inspection will be taken by the competent authority. In a case of a Priority II inspection is conducted, the ship remains in that category for when it arrives at another port from the same MoU.

3.3.5 CARIBBEAN MOU

"The Memorandum of Understanding on Port State Control in the Caribbean Region was signed in Christ Church, Barbados on February 9, 1996, by nine States. The membership has since increased to twenty States, namely Anguilla, Antigua & Barbuda, Aruba, The Bahamas, Barbados, Belize, Bermuda, British Virgin Islands, The Cayman Islands, Cuba, Curacao (formerly the Netherlands Antilles), Dominica, France, Grenada, Guyana, Jamaica, Montserrat, The Netherlands, Saint Kitts and Nevis, Saint Lucia, Saint Vincent & the Grenadines, Sint Maarten, Suriname, Trinidad and Tobago and Turks and Caicos Islands." (Caribbean MoU, n.d.)

The observers are Anguilla, Bermuda, Dominica, The British Virgin Islands, Haiti, St. Lucia, Sint Maarten, St. Vincent, and the Grenadines, Turks, and Caicos Islands. There is, also, a committee and a secretariat.

The aim of each administration is to be able to carry out an annual set of inspections equivalent to 15% of foreign merchant ships. In order to select which of the ships are necessary to be inspected, the Administrations use the Caribbean Maritime Information Center (CMIC) which is a computerized system with information on ships inspected in the national ports.

The Caribbean MoU consists of two annexes which are:

- ❖ Annex 1 Information System on Inspections
- ❖ Annex 2 Membership of the Memorandum

It is understood that this memorandum is not like the rest and there is a different structure because there is not a mention to Ship Risk Profile.

3.3.6 INDIAN OCEAN MOU

"The Indian Ocean Memorandum of Understanding (IOMoU) on Port State Control (PSC) in the Indian Ocean region was finalized on the basis of the first preparatory meeting held in India in October 1997 and the second meeting in June 1998 in South Africa. The first Committee meeting of MoU took place in Goa. During this meeting in Goa from 20th to 22nd January 1999 the countries that signed acceptance of the Memorandum of Understanding, they are Australia, Eritrea, India, Sudan, South Africa, and Tanzania. Subsequently, Mauritius, Sri Lanka, Iran, Kenya, Maldives, Oman, Yemen, France, Bangladesh, Comoros, Mozambique, Seychelles, Myanmar, and Madagascar acceded to the MoU." (Indian Ocean MOU, 2021)

The Secretariat of IOMOUs is based in Goa, India. The only Observer State of the IOMOU is Ethiopia and the Observer organizations are, the Paris Memorandum of Understanding, the Tokyo Memorandum of Understanding, , the Riyadh Memorandum of Understanding, the Black Sea Memorandum of Understanding, the Caribbean Memorandum of Understanding, the West & Central Africa Memorandum of Understanding, the International Maritime Organization, the International Labor Organization, United States Coast Guard and Equasis.

The aim of the Port State Control system is to find foreign-flagged ships that have anchored in a state port but do not comply with applicable International maritime conventions and each authority guarantee that every ship will bright into compliance. There are targeting criteria that are applied in order to select the appropriate ship for inspection. An important role has the Indian Ocean MoU database which is called IOCIS. The New Inspection Regime (NIR) of the IOMOU is implemented from the 1st of January 2018.

Ship Risk Profile

According to IOCIS, in the case of the Indian Ocean MoU, the ships are categorized as High-Risk Ships (HRS) which meet criteria to a total of 5 or more weighting points based on calculations of HRS parameters in the previous 36 months, as Standard Risk Ships (SRS) which is neither risked as HRS nor LRS and as Low-Risk Ships (LRS) which meet all the criteria of the LRS parameters and has at least one inspection in the previous 36 months. This categorization is based on generic and historical performance parameters.

Parameter		High Risk Ship (HRS) (When sum of weighting points >=5)		Standard Risk Ship (SRS)	Low Risk Ship (LRS)
		Criteria	**Wt. Pts.**	**Criteria**	**Criteria**
Type of Ship		Oil tanker (313) Gas Carrier (320) Chemical tanker (330) Bulk carrier (340) Passenger ship (371)	2	Neither HRS nor LRS	---
Age of Ship	All Types	> 12 years	1		---
Flag	Performance	Very Low / Low	1		High
	Audit	---	---		Yes
RO	RO of IOMOU	---	---		Yes
	Performance	Very Low / Low	1		High
Company	Performance	Very Low / Low	2		High
Ship	Deficiency Ratio	High	1		Low
	Detentions	= 2 detentions	1		
		>= 3 detentions	2		No detention

Figure 49: Ship Risk Profile of Indian Ocean MoU (Indian Ocean MOU, 2021)

Inspection and Selection Scheme

There are two categories of inspections. First, the periodic inspections exist which are carried out at an interval determined as per SRP, and second, there are some Overriding or Unexpected factors that might create an additional inspection in between periodic inspection. The time window for HRS is between 5-6 months, for SRS is between 10-12 months and for LRS is between 18-24 months after the last periodical or additional inspection. Furthermore, in the Priority I have included ships that have overcome the time window or there is an overriding factor. In Priority II ship can be inspected in the time window which is still open or there is an unexpected factor. There is a case that there aren't any overriding or unexpected factors, and the time window does not exist. This called no priority.

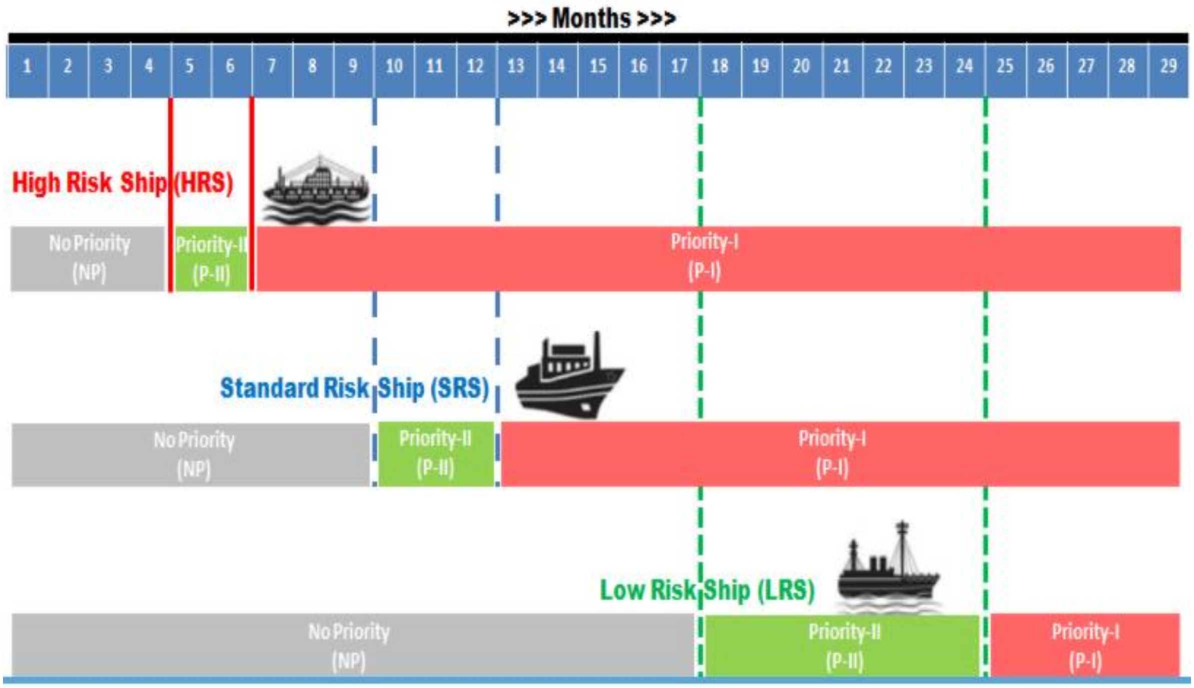


Figure 50: Selection Scheme of Indian Ocean MoU (Indian Ocean MOU, 2021)

3.3.7 MEDITERRANEAN MOU

"Within the International effort to increase the Maritime Safety and the prevention of pollution and within the activities of the Euro-Med conference that was held in Barcelona 28th of November 1995, it was declared the birth of cooperation project financed by the E.C. under the umbrella of the IMO and ILO. This declaration was developed according to STCW 95 and the international community interest in activating the role of Port State Control to a proposed agreement for southern and eastern Mediterranean countries for a Port State Control System." (Mediterranean MOU, 2021)

The first meeting was in Tunisia on 25-29 March 1996 and the second was in Casablanca, Morocco from 10-14 December 1996. The third meeting which was the final meeting completed in Valletta, Malta from 8-11 July 1997. From that time onwards the Mediterranean region included eight countries which were Algeria, Cyprus, Egypt, Israel, Morocco, Malta, Tunisia, and Turkey. Later in 1997 Lebanon was included and in July 1999 was signed by Jordan. The observers of Mediterranean MoU are the International Maritime Organization (IMO), European Union (EU), International Labour Organization (ILO), Black Sea MoU, Paris MoU, and U.S. Coast Guard. There is, also, a committee that has 21 meetings and the last one was in

Casablanca, Morocco on 31st October 2019. The Secretariat is in Alexandria and the Information Center (CIMED) in Casablanca.

“Each Authority has the obligation to implement an annual total of inspections corresponding to 15% of the estimated number of individual foreign merchant ships which entered the port of its State in a period of 12 months.

- ❖ Annex 1 Port State Control procedures
- ❖ Annex 2 Procedures for investigation under MARPOL 73/78
- ❖ Annex 3 Facts regarded as “Clear Grounds”
- ❖ Annex 4 Information system on inspections
- ❖ Annex 5 Publication of information for PSC
- ❖ Annex 6 Qualitative criteria for adherence to the Med MoU
- ❖ Annex 7 Port State Control Officer criteria and requirements
- ❖ Annex 8 Appeal and review procedures
- ❖ Annex 9 Selection criteria (target factor)
- ❖ Annex 10 Refusal of Access
- ❖ Annex 11 List of Certificates to be verified” (Mediterranean MOU, 2021)

This Memorandum doesn’t have an annex with Ship Risk Profile like the others, but it has a target factor. In this section the Authorities will choose the ships with the higher Target Factor. This information come from the MedSIS system. The Target Factor of the ship will be the sum of all applicable criteria points. Some elements for the targeting factors consist the ships of a state which is signing the memorandum for the first time, ships which has not inspected within the previous 6 months, ships whose certificates have been issued by a non IACS organization, ships with a blacklisted flag, ships which have left the previous port with deficiencies or ships which have a previous detention, ships flying the flag of a non-party to a relevant instrument and the last one there is no a vessel age limitation but only ships above 13 years old. The figure below presents the targeting matrix with more details.

CRITERIA	TARGET FACTOR
Ship Age	0 - 5 years: 0 point 6 - 10 years: 5 points 11-15 years: 10 points 16 - 20 years: 10 + 1 point for each year exceeding 15 years >20 years: 15 + 2 points for each year exceeding 20 years
Ship type	4 points for ships with type codes 13, 30, 40, 55, 60, 61, 70, 71 and of 15 years of age and over 0 points for all others
Ship flag - Excess of average detention, based upon 3 year rolling average figure	+1 point for each percentage point in excess (decimal number rounded up)
Deficiencies	0.6 points for each deficiency found in last 4 initial inspections or follow up with new deficiency (decimal number rounded up)
Detentions	Depending on number of detentions in last 4 inspections: 1 detention - 15 points 2 detentions - 30 points 3 detentions - 60 points 4 detentions - 100 points
Classification Society - non IACS	10 points
Outstanding deficiencies (A deficiency recorded in the MedSIS in the last inspection and not marked as rectified (Code10))	2 points for each outstanding deficiency
Time since last inspection: 6 - 12 months 12 - 24 months Over 24 months or never inspected in Med MoU region (including new ships)	3 points 6 points 50 points
Calculation method	The target factor is the sum of the TFV Values Calculated daily
Priority level Target Factor 101 - 41 – 100 11 – 40 0 – 10	 Priority 1 (very high) Priority 2 (high) Priority 3 (medium) Priority 4 (low)

Figure 51: Targeting Matrix od Med MoU (Mediterranean MOU, 2021)

3.3.8 RIYADH MOU

The Riyadh Memorandum of Understanding was signed in June 2004 and includes 6 countries which are Bahrain, Oman, Qatar, Kuwait, Saudi Arabia, and the United Arab Emirates.

The main goal of the agreement is the safety, efficiency, and the proper implementation of the system of Port State Control in the Gulf region. The Riyadh MoU has established a Secretariat and an Information Center in Oman which allow Authorities to associate and exchange information between them. The executive body is the Committee which consists of representatives of the six States.

"Each Authority, has the obligation to conduct within a period of 3 years from the coming into effect of the Memorandum an annual total of inspections corresponding to 10% of the estimated number of individual foreign merchant ships which entered the ports of its State during a recent period of 12 months." (Riyadh MoU, n.d.)

This memorandum also follows the same procedure for inspecting ships as the other memorandums. It includes the initial inspection of the documents and certificates and the general condition of the ship and then depending on the findings and the judgment of the PSCO will either follow a more detailed inspection or not.

There are certain criteria as to the priority given to the ships to be inspected. These include:

- "Ships visiting a port of a State the Authority of which is a signatory to the memorandum, for the first time or after an absence of 12 months or more.
- Ships which have been permitted to leave the port of a State, the Authority of which is a signatory to the Memorandum, on condition that the deficiencies noted must be rectified within a specified period, upon expiry of such period.
- Ships that have been reported by pilots or port authorities as having deficiencies that may prejudice their safe navigation.
- Ships whose statutory certificates in the ship's construction and equipment, have not been issued in accordance with the relevant instruments.
- Ships carrying dangerous or polluting goods, which have failed to report all relevant information concerning the ship's particulars, the ship's movements, and concerning the dangerous or polluting goods being carried to the competent authority of the port and coastal State.
- Ships which have been suspended from their class for safety reasons in the course of the preceding six months." (Riyadh MoU, n.d.)

The Authorities will not inspect ships which had undergone the same procedure within the previous 61 months by other Authorities. This, of course, does not apply if there are suspicions of clear grounds.

The inspections will be taken place by a qualified and authorized person who carries a personal document, a kind of identity card. The PSCO mustn't have personal or commercial interest for the port or the inspected ship. He/ she mustn't work on behalf of non-governmental organizations which issued certificates about the ship. At the end of the inspection, the PSCO will give the results of the inspection in the Master. If there are deficiencies the PSCO will inform the Master about the corrective action. But if the deficiencies are threatening the environment or the human health, the Authorities will detain the ship until these deficiencies are restored. In this case, the Authorities should immediately notify the Flag State and the recognized organization.

The Riyadh Memorandum of Understanding is different from the others because there isn't a targeting matrix and there are no policies about the age limitation of vessels. However, there are limited information and data about this MoU.

3.3.9 VINA DEL MAR MOU

The Acuerdo de Vina del Mar (Vina del Mar or Latin-America Agreement), signed in Vina del Mar (Chile) on 5 November 1992. It was adopted by Resolution No.5 of the 6th Meeting of the Operative Network for Regional Cooperative among Maritime Authorities of Cuba, South America, Mexico, and Panama.

This Agreement has fifteen member States. The first members were Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Panama, Peru, Uruguay, Venezuela, and later were added Cuba (1995), Bolivia (2000), Honduras (2001), Guatemala (2012), and Dominican Republic (2012).

Additionally, the observers of the Latin-America Agreement are the International Labor Organization (ILO), the International Maritime Organization (IMO), the U.S. Coast Guard, the Black Sea MoU, the Paris MoU, the Tokyo MoU, and the ROCRAM.

The Agreement is divided and based on two essential bodies which are the Committee of the Agreement and the Secretariat. The Secretariat includes the Information Center (CIALA). The main aim is safety in this specific region. Also, it promotes collaboration between countries and guarantees that the foreign flagged vessels mooring in their ports comply with the regulations established by International Conventions.

The targeting matrix is simple because it provides a sufficient and efficient system of Port State Control. The Authorities are obliged to conduct at least 20% inspections of the total foreign vessels that visit their ports every year. The next inspection will carry out after six months unless the ship transfers dangerous goods or it is a passenger or a bulk carrier. And there is a priority factor displayed by the Vina del Mar Agreement Information Centre (CIALA) and in this database has access each inspector. Last but not least there are no limitations of ship age.

3.4.1 PORT STATE CONTROL INSPECTIONS IN THE UNITED KINGDOM

The United Kingdom has established the Maritime and Coastguard Agency (MCA) whose main role is to carry out inspections on foreign-flagged ships visiting their ports for implementing the international safety rules. It is important to note that the United Kingdom is part of the Paris MoU and is obliged to implement the regulations and laws adopted by the Paris MoU. However, the United Kingdom has enacted its own legislation about the Port State Control inspections which operates and complements the regulations of the Paris MoU. The MCA's Regulation 2011 S.I. No 2601, the Merchant Shipping Notice MSN 1832, and the Merchant Shipping (Port State Control) Regulations 2011 are included in the UK law.

Ship Risk Profile

As in the Paris MoU, ships are categorized into high, standard, low ship risk profile, which is calculated daily and published in the database. The result of this calculation is the division of ships into priorities and the type of inspection that will follow. The targeting matrix embodies the criteria on which the ship risk profile is based such as age, flag, type, R.O., company performance, and detention history, and the frequency of inspections.

"Ships with a high, standard, or low-risk profile will be inspected after 6, 12, or 36 months respectively. Ships with overriding factors will be inspected regardless of the period since the last inspection and at the professional judgment of the inspector. Inspections at the discretion of inspectors may take place before they are due – from 5, 10, or 24 months after the previous inspection in the Paris MoU region for a ship with a high, standard, or low-risk profile, respectively. The interval to the next inspection restarts after each inspection." (Maritime and Coastguard agency Port State Control, 2022)

Furthermore, ships planning to approach UK ports must inform 72 hours before the expected arrival time or before departing from the previous port in case the voyage is less than 72 hours. It is important to mention that the ship risk profile influence the types of inspections which will be held in the ports of United Kingdom. Expanded inspections are conducted on high-risk ships. Ships characterized as high, standard and low risk if they have not inspected the previous 5, 10 and 24 months, respectively, in the Paris MoU region.

3.4.2 PORT STATE CONTROL INSPECTIONS IN AUSTRALIA

The Port State Control regime in Australia is characterized as the strictest and tightest of all. Australia is one of the largest economies in the world based on its maritime trade and the countless imports and exports it carries out annually. In order to ensure this prosperity of the maritime industry it is important to remain safe and efficient by following the international regulations. This is secured through the Port State Control activities of the Australian Maritime Safety Authority (AMSA).

AMSA has a specific way to calculate the risk profile and choose the proper ships. These factors are the environmental risk, the ship complaints and the targeting scheme. Under normal circumstances the ships are inspected every six months but if deemed necessary this period is reduced and there are no age limitations. Ships are divided into priority groups and each group is obliged to inspect a specific rate. All data comes from the Shipsys database which includes information about the general condition of the ship, the age and the PSC inspection history. Through this database, the probability of a ship being detained is calculated in the form of a percentage. The higher this percentage the ships are considered high risk.

Priority group	Probability of detention (risk factor)	Target inspection rate
Priority 1	More than 5%	80%
Priority 2	4% to 5%	60%
Priority 3	2% to 3%	40%
Priority 4	1% or less	20%

Figure 52: Target rate (AMSA, 2021)

During the inspection, the PSCO has a Ship Inspection Record (SIR) book, or a notebook computer and it provides information and all the forms. Also, inspectors follow a set of instructions and a ship manual which are based on the IMO and ILO. The inspector starts with the initial inspection as provided in all the MoUs and checks the documents and certificates if they are legal and valid. In order to facilitate and make the inspection more effective, PSCO follows some guidelines to better identify unsuitable ships. In addition, it must ensure the safe operation of the ship, equipment and crew. If clear grounds are confirmed, then a more detailed inspection or an expanded inspection is carried out. It is obvious that inspectors use their professional judgment in the whole procedure.

According to Administrative Appeals Tribunal Act. 1975, the decision to detain a ship is reviewed and every effort is made to avoid it, or a possible delay of the vessel. AMSA provides the Master an opportunity in each Port State Control Inspection to declare if any known defect exists. After that, the Master should sign a declaration. This is an opportunity for the Master to identify and escalate the defects and recommend any corrective actions. The communication of the several issues between the Owner or the Manager and AMSA is conducted through the exchange of messages. The contact details are provided in every form A or B and the details are sent via an email. Through email communication, AMSA will be aware of different issues like the closing deficiencies, however it should be noted that database records may not be updated unless the corrective action is sighted by an AMSA inspector or a PSCO from another Tokyo MoU member.

3.4.3 PORT STATE CONTROL INSPECTION IN THE USA

"The U.S. Coast Guard (USCG) administers a comprehensive Port State Control (PSC) examination program in order to ensure safe, secure, and environmentally responsible shipping that supports the global objective of eliminating substandard ships. The USCG screens vessels before arrival in U.S. ports and assesses a multitude of regulatory and risk-based factors in order to determine foreign vessel examination requirements." (United States Coast Guard, n.d.)

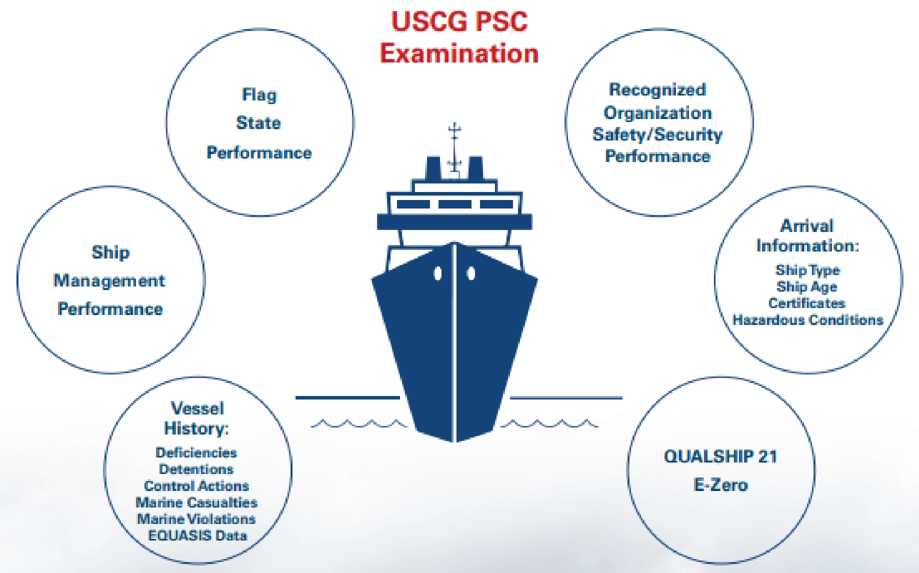


Figure 53: USCG PSC Examination (United States Coast Guard, 2021)

Coast Guard's Port State Control (PSC) program targets on the substandard vessels. Through the Port State Control examination aims at the proper application of international conventions, US laws and US regulations for the foreign-flagged vessels which berth in US ports. It is important to ensure that the crew, the property(vessel), the marine environment and the disruptions to marine commerce will not be put in danger.

The most important factor is the vessel age limitation. Vessels under ten years of age have their targeting factor reduced in their scoring system. On the other hand, vessels up to twenty-five years old will have sure a bigger score. The U.S. Coast Guard has a different system in which assesses the vessels during the Port State Control inspection. This system is called International Ship & Port Facility Security Code (ISPS) and was implemented on 1st July 2004.

TARGETING OF FOREIGN VESSELS

COLUMN I SHIP MANAGEMENT	**COLUMN II** FLAG STATE	**COLUMN III** RECOGNIZED SECURITY ORGANIZATION	**COLUMN IV** SECURITY COMPLIANCE HISTORY
ISPS II Owner or operator, if new owner or operator since last ISPS exam.	**ISPS II** If new flag since last ISPS exam.	**ISPS I** 3 or more RSO-related major control actions in the past 12 months.	**ISPS I** Vessel with an ISPS-related denial of entry/expulsion from port in the past 12 months.
5 Points Owner, operator, or charterer associated with one ISPS-related denial of entry or ISPS-related expulsion from port in past 12 months or 2 or more ISPS/MTSA Control Actions in a 12 months period.	**7 Points** SOLAS Vessels Flag State has a CAR 2 or more times the overall CAR average for all flags States.	**5 Points** 2 RSO-related major control actions in the past 12 months.	**ISPS III** If matrix score does not result in ISPS I priority & no ISPS compliance exam within the past 12 months or a stowaway incident.
	2 Points SOLAS Vessels Flag State has a CAR between the overall CAR average and up to 2 times the overall CAR average for all flag States.	**2 Points** 1 RSO-related major control action in the past 12 months.	**5 Points** Vessel with an ISPS/MTSA-related detention in the past 12 months.
	7 Points Non-SOLAS Vessels Flag State has a CAR 2 or more times the overall CAR average for all flag States.		**2 Points** The vessel has had 1 or more other ISPS/MTSA control actions in the past 12 months.
Total:	**Total:**	**Total:**	**Total:**
Total Targeting Score:		Vessel Priority:	

Table 1 Targeting of Foreign Vessels (United States Coast Guard, n.d.)

Firstly, in ISPS I category corresponds to vessels that have collected 17 points and above and must be inspected before entering the port. Secondly, in ISPS II category includes vessels that have gathered between 7-16 points and will be inspected when they arrive at the port. Thirdly, vessels with less than 7 points belong to the ISPS III category and inspection is not necessary unless they are chosen at random. The purpose is to identify ships that sail in US waters and do not comply with the provisions and the applicable laws or regulations.

3.5. QUALSHIP 21

The QUALSHIP 21 programme is aiming at recognizing foreign vessels that have adopted and implemented strict compliance with the international regulations of safety and environment. The Coast Guard tries to improve the methods for identifying the substandard ships. Furthermore, except for the score that a vessel receives in the targeting matrix, all foreign vessels are obliged to be examined at least once a year whether they belong to the high-risk category or not. High-quality vessels should be recognized and rewarded for their commitment to safety and quality. From 1 January 2001, this program began about the identification of high-quality ships and it aspires to better and sustainable shipping. For the period of July 1, 2021, through June 30, 2022, there are 23 eligible Flag Administrations for the QUALSHIP 21 Program which are: Bahamas, Bermuda, Canada Cayman Islands, Denmark, France, Germany, Gibraltar, Greece, Hong Kong, Isle of Man, Italy, Jamaica, Japan, Marshall Islands, Netherlands, Norway, Republic of Korea, Saudi Arabia, Singapore, Spain, Taiwan, and United Kingdom.

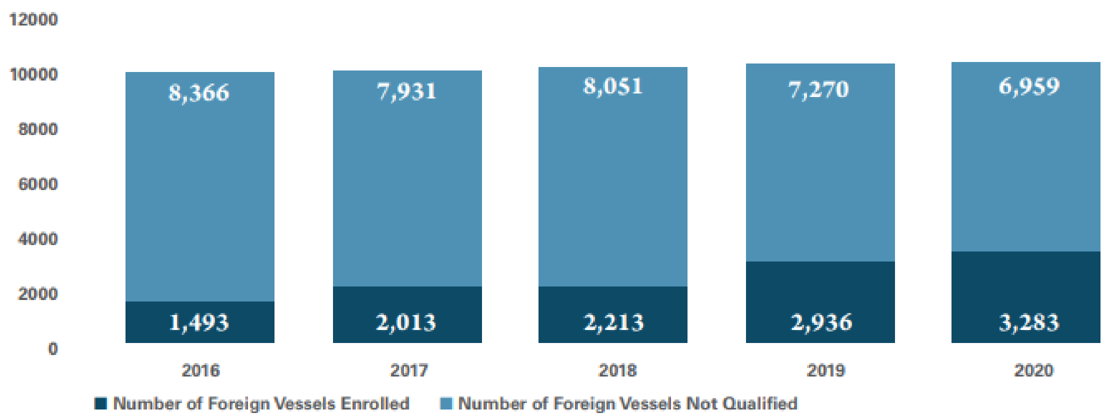


Figure 54: Yearly QUALSHIP 21 Enrollment 2016-2020 (United States Coast Guard, n.d.)

3.6. E-ZERO

"Beginning July 1st, 2017, vessels enrolled in the QUALSHIP 21 program may also seek the E-Zero designation if they meet the requirements set forth below. The E-Zero program is a new addition to the existing QUALSHIP 21 program, and this program intends to recognize those exemplary vessels that have consistently adhered to environmental compliance, while also demonstrating an immense commitment to environmental stewardship. These vessels will receive the E-Zero designation on their QUALSHIP 21 certificate." (United States Coast Guard, n.d.)

3.7. QUALSHIP 21 & E-ZERO PROGRAM CRITERIA

The vessels who desire to enroll in the Qualship 21 program must observe some eligibility criteria. First of all, must be a non-U.S. flagged vessel. The vessel should be associated with a company with a good reputation, must be registered with a qualified flag administration, and should have an excellent history in U.S. waters. It is so important that the vessel may not have been detained and not have been characterized as substandard within the previous 36 months. Furthermore, the vessel must not have marine violations, no more than one Notice of Violation (NOV), or serious marine casualties (46CFR4.03-2) and (46CFR4,40) for three years. The vessel must have completed a successful U.S. Port State Control Safety and Environmental Protection Compliance examination within 24 months. The vessel may not be owned, operated, managed, or chartered by any company which is related to another vessel, which is to be subject to detention in U.S. waters in a period of 24 months. Finally, the vessel cannot have its statutory convention certificates issued by a targeted recognized organization.

The flag administration cannot have a detention ratio greater than or equal to 1.0% during a period of 3-year rolling average and have at least 10 PSC examinations in the U.S. in the previous three years. The vessel's flag administration must submit a Self-Assessment performance to the IMO and provide a cory to the U.S. Coast Guard and it should submit an Executive Summary from their Member State Audit Scheme to the U.S. Coast Guard.

For the E-Zero program designation, a vessel should fulfill some criteria. Firstly, the vessel must be enrolled in Qualship 21 and maintain certification for the past three years. Moreover, it is significant to have zero worldwide MARPOL detentions, zero environmental deficiencies over the past three years, and zero Letters of Warning, Notice of Violation, or Civil Penalties related to Right Whale Mandatory Ship Reporting or speed restriction violations over the past 5 years. The last one is that the vessel should have installed CG type-approved Ballast Water Management (BWM) system or operate without a BWM compliance date extension letter granted in accordance with 33 CFR 151.2036.

There is a huge difference in the US legislation on Port State Control inspections compared to the other memorandum. A Qualship 21 Certificate is provided in ships which adopt quality vessel operations, and this certification is valid for 3 years after the last Port State Control exam. This practice targets to motivate more ships. The US law obliges the tankers to be inspected annually and the Coast Guard issues a Certificate of Compliance (COC) which has two years validation. If vessels don't have this certificate or it is expired, then they won't have access in this country and they won't conduct cargo operations. For this reason, the tanker owners have the right to renew this certification 2 months before it expires. Also, they need some extra documents like the voyage contract to lighter in the US, the proof of user fee payment, the vessel particulars, the International Oil Pollution Prevention Certificate (IOPP) and its Form B Supplement, the Document of Compliance (DOC) and the Safety Management Certificate (SMC), the Vapour Collection System (VCS) certificate and an approved vessel response plan. Furthermore, non-US tankships have the ability to be inspected out of the USA borders, when resources permit and if the examination is considered to be mutually beneficial to the Coast Guard. Additionally, chemical tankers must have a Certificate of Fitness (COF) and/or the International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk Noxious Liquid Substances (NLS) certificate. And the gas carriers should have the International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances (NLS).

3.8.1 DATABASES

The port authorities cooperate with each other and use databases in order to know which vessels need an inspection, which had previous deficiencies, which were recently inspected, and many other such elements which help to identify substandard vessels and make the work of PSCO more productive. The databases used are THETIS and APCIS. These are the information system of Paris and Tokyo respectively. They provide information such as previous inspectors' reports, port arrival lists, shipping schedules, and other useful information. Extra international databases exist which advise and provide information for inspections that carried out all over the world. This database is called EQUASIS and was established in 2000.

3.8.2 EQUASIS

One of the biggest obstacles to shipping is the lack of transparency associated with the ship. This information may be collected but not everyone has access to it. Thus, in June 1998, a very important decision was taken at the Shipping Quality Conference in Lisbon. All shipping professionals, including shipowners, brokers, cargo owners, classification societies, ports, and terminals, have called for this to be changed and for there to be an organized system in which they can be informed about ship-related issues and to make existing information easier for them. After this fact, the European Commission and the French Maritime Administration created the system called EQUASIS which includes information and data about the ship's safety and it is available for free on the internet.

"The main principles associated with the set-up of the EQUASIS information system were as follows:

- Equasis should be a tool aimed at reducing substandard shipping, and it should be limited to safety-related information on ships
- Equasis has no commercial purpose, it addresses public concern and should act accordingly
- Equasis should be an international database covering the whole world fleet
- Active co-operation with all players involved in the maritime industry is needed
- Equasis will be a tool used for better selection of ships, but it will be used voluntarily and there will be no legal pressure for industry to use it.

The EQUASIS website went live on 17th May 2000." (EQUASIS, n.d.)

3.8.3 THETIS

EMSA in collaboration with the European Commission and the Member States has created a most recent information database that will be related to the New Inspection Regime for Port State Control. This new system of inspections is very important because it will help the Member States with the PSC procedures through centralized storage and distribution of reports. The database Thetis is applied on Paris MoU and entered into force in January 2011 and replaced the previous system called Sirenac. This new regime is a continuation of the Sirenac but it focuses more on the inspections and is based on the latest developments in IMO.

The main targets are to assist the Member States with targeting and selecting the right vessel for inspection. It is important to distinguish the HRS, SRS, and LRS and the priority. Secondly, it assists the Commission and EC, and the Member States by providing statistics on inspection results and performance and it has the obligation to ensure that the Member States apply the rules.

Thetis database has the ability to handle 25.000 inspections annually. It audits the risk ship profile of each ship in a system with a daily performance and sends in a piece of port information about a ship in real-time. Moreover, it has easy access, a simple structure and it provides consultancy.

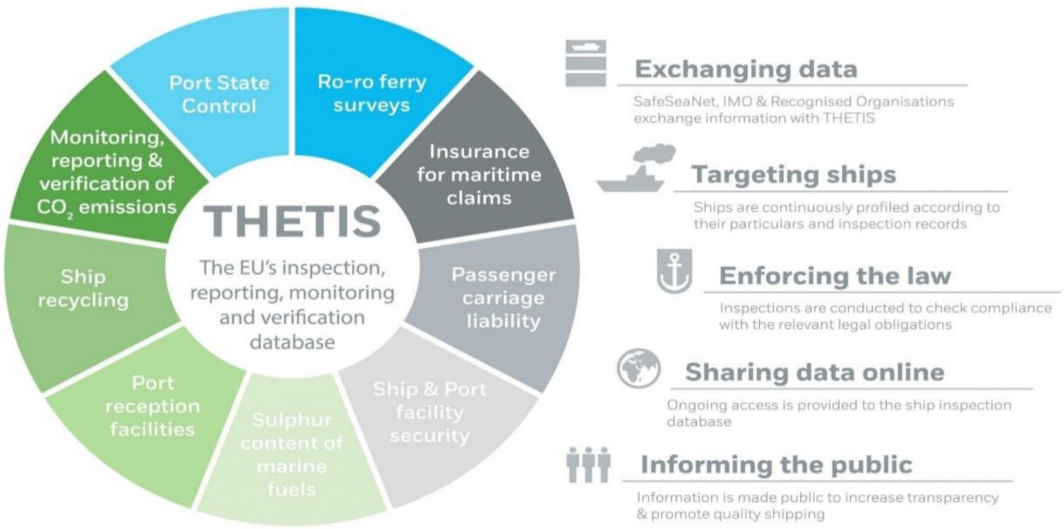


Figure 55: Thetis Data System (smartmaritimework, n.d.)

3.8.4 APCIS

The Asia Pacific Computerized Information System (APCIS) is the data system about the Memorandum of Understanding on Port State Control in the Asia Pacific Region (Tokyo MoU). The main role is to gather information about the inspections from the PSC officers on a daily basis and secondly, PSC officers have the ability to be informed about specific or substandard ships. Furthermore, Authorities can have access to information through the databases for ships in other regional ports. This assists them to select foreign flags ships which should be inspected and their exercise of port State control in selected ships. Also, it compiles statistical reports, calculates Ship Risk Profile and Inspection Priority, collects CIC reports and the CIC results. The central offices of the APCIS are established in Moscow, under the auspices of the Ministry of Transport of the Russian Federation.

3.8.5 SAFESEANET

SafeSeaNet is a European shipping exchange system information, which was created with the main objectives of improving safety navigation, ship, and port security. Also, it aims to protect the marine environment and to improve the effectiveness of maritime traffic and shipping. SafeSeaNet is a platform that connects authorities of the participating countries (EU, Norway, Iceland) and it allows them to exchange maritime data. These data include estimated and actual arrival and departure times of ships at ports, details of transported dangerous and polluting loads, information on marine incidents and accidents, information on the exact number of passengers, and positions of the ships based on the reports of the Automatic Identification System (AIS). It was created by EMSA and the target is a common database and the location of ships through telecommunications systems.

3.9. FACTORS INFLUENCING THE PERFORMANCE OF THE PORT STATE CONTROL (PSC) INSPECTIONS

Port authorities are aware that inspecting all foreign vessels entering in their ports may become financially unprofitable and sometimes unnecessary on ships that have a satisfactory level of security. The method used by the port authorities is to comply with some general inspection rates in order to inspect even a small number of ships. Therefore, to identify which ships need inspection draws information from the databases like Thetis of the Paris MoU and international databases like EQUASIS.

The main criteria, which are used by the port authorities in order to identify the vessels which are under the standards and need an inspection, are called “targeting factors”. The targeting factors are the generic factors due to their nature because these characteristics are predictors of deficiencies. First of all, these characteristics embody the type of ship which is very important because every ship category has different necessities due to the nature of the cargo. Statistics researches have shown that the bulk carriers and general cargo vessels have the most inspections and the most detentions. Secondly, a crucial characteristic is the age of the ship. A lot of States prefer to inspect older ships because they believe that an old vessel entails more environmental risks than a newer one. Great importance has the flag of the ship and the classification society. Many times, the deficiencies and detentions related to the flag and the class of a ship. It has been observed that the flags of convenience accumulate more deficiencies and detentions. Furthermore, a special characteristic is the previous history of the ship. If a vessel had caused problems in the past or had suffered from another detention or deficiency, it will be more likely to be inspected. The last one is the shipowner. It is important the history and the performance of all ships in a company's fleet. All these criteria directly affect the ship's operation. For this reason, every MoU has developed a specific scoring system that helps in identifying these targeting factors.

Except for the targeting factors, there is another equally important category and called "overriding factors". These factors permit the inspector to proceed directly to conduct a more detailed inspection or an expanded inspection. These factors involve the ships which reported by another Member State, the ships which caused an accident or grounding or a collision or something else on the way to the harbor. Thirdly, the ships which blamed for an alleged offense of the provisions on the discharge of harmful substances or effluents. Also, an overriding factor is considered when a ship does not adopt the safe navigational practices and procedures. Finally, some ships have problems with the Classification Society and there are some else that they do not exist in the database. The international standards of ships' inspections are influenced by all these factors.

3.10. TYPES OF INSPECTIONS

In this chapter will be analyzed the types of inspections of Port State Control (PSC). It is important to highlight that each Port State Control (PSC) inspection is conducted for the purpose of confirming that the equipment, the condition, and the crew comply with the standards of International Conventions. The most suitable person to carry out the inspections is the Port State Control Officer (PSCO) because he is properly trained and experienced. The types of inspections are presented as four. Thus, the first type is the initial inspection, the second type is the more detailed inspection, the third type is the expanded inspection, and the final type is the Concentrated Inspection Campaign (CIC). Also, during the inspections, it is necessary to be on board the Resolution A.1052(27) by IMO which helps to ensure that inspection procedures are properly implemented.

3.10.1 INITIAL INSPECTION

The PSCO arrives on board without notice. Before boarding the ship and meeting the master, PSCO gets the first impression of the ship's condition. In initial inspection, the PSCO checks the certificates and documents which must be in the ship and be in force. Special attention will be given to the certificates which they have issued by an unrecognized organization as well as those without flags ratifying a contract. Additionally, careful examination will be done in the oil books, waste, and ship logs. However, if a certificate is missing or it has expired, it does not mean that the ship must be detained because it depends on the weight of the certificate, and it will be checked by the inspector. Then, he carries out a general inspection about the general condition of the vessel and if there are serious clear grounds indications, he will enter into a more detailed inspection. If the PSCO notes any irregularity, he will notice it. The deficiencies of the ship can be recognized at any stage of inspection and even one observation is enough to hold the ship until restored. Furthermore, after the validation of certificates, he will check that the condition and hygiene of the whole ship which include the navigation bridge, the engine room, the cargo holds, the accommodation, and gallery, and the decks including the forecastle. PSCO examines whether they meet the requirements of international standards and regulations and checks if observations of the previous audit have been restored within the time specified.

If the certificates are valid and the general impression and PSCO visual observations on board confirm good maintenance standards, then the PSCO may limit the inspection. It is likely that PSCO will want to get a more general picture of the vessel by visiting some rooms. Nevertheless, If PSCO has notified clear grounds, he is obliged to carry out a more detailed inspection and the resolution A.787(19) provides the general instructions. If he proceeds to a more detailed inspection, then the master must be informed. This resolution reminds PSCO that the main purpose of the Port State Control is to deter a vessel if it poses an unwarranted threat to the marine environment. If deficiencies cannot be resolved at the port of inspection the PSCO should allow the vessel to go to another port, with the proper infrastructure, under certain conditions and the authorities and the flag must be notified.

3.10.2 CLEAR GROUNDS

The category of “clear grounds” is very important for the whole inspection because it can lead to a more detailed inspection and finally the ship to detention. Clear grounds exist when the PSCO has evidence that the ships’ general condition and the equipment or the crew or the working and living conditions of seafarers are inappropriate or inadequate.

“Especially, the “clear grounds” includes:

1. the absence of principal equipment or arrangements required by the applicable conventions;
2. evidence from a review of the ship’s certificates that a certificate or certificates are clearly invalid;
3. evidence that the required documentation is not on board, incomplete, not maintained, or falsely maintained;
4. evidence from the PSCO’s general impressions or observations that serious hull or structural deterioration or deficiencies exist that may place at risk the structural, watertight, or weathertight integrity of the ship;
5. Evidence from PSCO’s general impressions or observations that serious deficiencies exist in the safety, pollution prevention, or navigational equipment;
6. information or evidence that the Master or crew is not familiar with essential shipboard operations relating to the safety of ships or the prevention of pollution, or that such operations have not been carried out;
7. indications that key crew members may not be able to communicate with each other or with another person on board;
8. the emission of false distress alerts not followed by proper cancelation procedures;
9. receipt of a report or complaint containing information that a ship appears to be substandard; and
10. the last one, the ships which have overriding or unexpected factors.”

(Paris MoU, n.d.)

It is not only these criteria because PSCO has the ability to find others during the procedure of inspection.

3.10.3 MORE DETAILED INSPECTION

A more detailed inspection is performed when there are evidence and clues that a vessel does not comply with international shipping standards. Also, it is important the condition of the ship, the crew or the equipment, or the working and living conditions of seafarers to meet the relevant requirements in order to avoid a more detailed inspection. Otherwise, PSCOs are assumed that the ship is substandard. Specifically, a more detailed inspection includes the areas where clear grounds are established and the areas relevant to any overriding or unexpected factors. Furthermore, includes the documentation, the propulsion and auxiliary machinery, the structural condition, the navigation equipment, the emergency systems, the water/weathertight condition, the radio communication, the fire safety, the alarms, the cargo operations, the living and working conditions, the lifesaving appliances, the dangerous goods and the pollution prevention. It is important to mention that in the more detailed inspection vital role has the human elements which covered by ILO, ISM, and STCW. The extent of this inspection depends on time, the number of deficiencies which found at the initial inspection, how many PSCOs are available, and a lot of other factors. However, an expanded inspection was carried out to confirm that the crew have the ability to cooperate and to coordinate for the shipboard operations.

3.10.4 EXPANDED INSPECTION

Additionally, in some types of ships, once a year, an extensive inspection is carried out. These types are the cruise ships, the bulk cargo ships over 12 years old, the oil tankers with a capacity of more than 20000gt, the oil product tankers with a capacity of more than 30000gt and over 20 years, and ships carrying gas or chemicals over 10 years. This inspection is additional to these types of vessels and does not replace the other inspections. The PSCO sometimes may not proceed with this inspection because it could delay the vessel. For example, an expanded inspection includes the operation of the emergency fire pump, a test of a lifeboat, an inspection of fire extinguishing systems in the engine room, a fire exercise, and many more.

3.10.5 CONCENTRATED INSPECTION CAMPAIGN (CIC)

After some serious deficiencies which repeated, it was decided to create the last category of inspections which ensure the compliance and the implementation with new convention requirements. All MoUs agreed to create the Concentrated Inspection Campaigns (CIC) which was added to the Port State Control inspection. This type of inspection has a duration of about two to three months and covers a wide variety of topics. These campaigns are run concurrently with a PSC inspection and use an additional checklist for every specific topic. For the year 2021 the Paris MoU, Tokyo, the Black Sea, Indian Ocean, Riyadh, and Vina del Mar MoUs will perform the CIC on stability in general. The questionnaire was published on 23 July 2021, and it contains eight aspects. Its main purpose is to verify that the ship's crew is properly trained and has the ability to recognize the actual stability condition before departure and to confirm that the ship follows the stability requirements (a sample on ship's stability is displayed below). The application period is from September to November 2021 and if deficiencies occur during the CIC, will report in the PSC inspection with the related PSC Code. Also, the Caribbean MoU plans to carry out a CIC on Ballast Water Management and the USCG is currently running a CIC limited to US-flagged vessels. Additionally, in combination with the CIC on Stability in General, AMSA runs a Focused Inspection Campaign (FIC) on Safety of Navigation which targets to the level of compliance with convention requirements on board.

Questionnaire for the 2020 CIC on Ship's Stability in general

CIC on Ship's Stability in general			
Inspection Authority			
Ship name		**IMO Number**	
Date of Inspection		**Inspection Port**	

QUESTIONS 1 - 6 ANSWERED WITH A "NO" MUST BE ACCOMPANIED BY A RELEVANT DEFICIENCY ON THE REPORT OF INSPECTION

No.	Questions	Yes	No	N/A	Detention
1*	Has the ship been provided with approved stability information which can be understood and easily used by the Master and loading officer?				
2*	Is the data used in the stability check for departure complete and correct?				
3*	Does the ship comply with the stability criteria as applicable to the ship type?				
4*	Is there evidence to show that the Master or responsible officer can determine the stability of the ship under varying conditions of service using the approved stability information provided on board?				
5*	If the ship is provided with a Stability Instrument, is it approved by the Administration?				
6	If the ship is provided with a Stability Instrument, does the type of stability software in use meet the requirements for the relevant ship type?				

No.	Questions	Yes	No	N/A
7 Note 1	[Is there evidence on board to show that the master/loading officer confirms that the "calculated" displacement and trim corresponds with the "observed" draughts?]			
8 Note 1	[If the ship is provided with a Stability Instrument, has the accuracy of the stability instrument been verified periodically by applying at least one approved test condition?]			

<u>If "No" is ticked for questions marked with an asterisk "*", the ship may be considered for detention</u>

<u>Note 1: Questions 7 and 8 are for information purposes only.</u>

Figure 56: Questionnaire for the 2020 CIC on Ship's Stability in general (Paris MoU, n.d.)

3.10.6 THE PORT STATE CONTROL INSPECTIONS PROCESS

Port State Control inspections conduct on foreign ships and the enterprise is either from Port State or from relevant information or information coming from a crew member, from an organization, from a trade association, or anyone interested in the ship's safety, the crew, and the prevention of an accident in order to protect the marine environment. When an inspection is to be carried out, there is no prior notice to the ship in order for the master, and the crew is not prepared. They must always be prepared.

The PSCO has experience in inspections, has a piece of good knowledge of English, and is qualified as a Flag State surveyor. He/she always carries an identity card that identifies the Port State Control authority. When the PSCO arrives on the ship, the gangway watchman will ask politely to show this identity card and the PSCO will be informed about the company's policy, he/she will wear the protective equipment and will declare the carrying items. Then, the PSCO will meet the Master. A conversation will start between the Master, the PSCO, and the members of the crew. During this meeting, the Master has the obligation to mention if the equipment is in good working and if the ship is seaworthy because during the inspection if PSCO finds any deficiency, he/she will report it with its appropriate code. Furthermore, from the opening meeting will be a deal that some tests may not be possible due to the nature and the Master will have the right to stop the inspection if he will deem that the inspection poses in danger the safety of the crew and the safe operation of the ship.

The procedure begins with the initial inspection which includes the verification of the ship's certificates and documentation. In case there are pending issues from the previous inspection then they will also be examined the rectifications. Then, a visual inspection follows in order the PSCO to form an opinion about the conditions of the ship and the crew. The PSCO should be escorted by a responsible officer all the time. The officer needs to know the ship and its spaces very well and have access to them with the necessary keys. If the PSCO has doubts about the escorting officer then he/she will mention them to the Master.

If PSCO detects an invalid certification or notes "clear grounds" at that time follows a more detailed inspection. If deficiencies are not found, the PSCO will fill Form A but if there are deficiencies, he/she will fill the Form A and the Form B. Then, follows the end of the process. At the closing meeting, which takes place on the bridge, the Master discusses with PSCO the findings and the deficiencies, and all the ambiguities. After the discussion, PSCO has the time to write and culminate the report. This report, which consists of Form A and Form B, will be discussed in order to be fully understood by the Master. Sometimes some of the deficiencies are rectified before the inspection is completed. In this case, they should be checked by the PSCO and removed from the report. The Master has the right to recall the PSCO on board to verify the rectifications. When PSCO departs from the vessel must be accompanied by a crew member. Through the inspection, the Master must be calm, polite, and patient even if it will arise an intent disagreement.

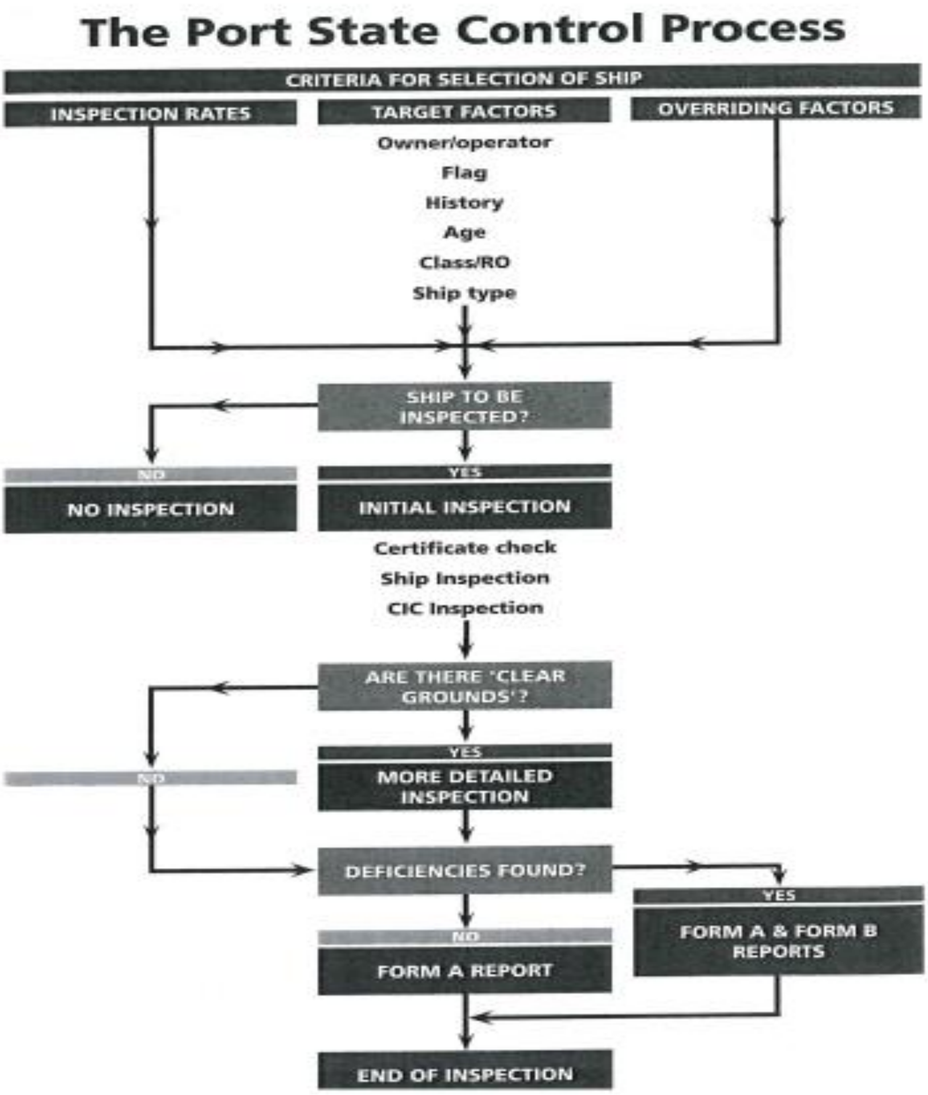


Figure 57: The Port State Control Process (IMO, 2021)

3.11.1 CODE OF GOOD PRACTICE

"Code of Good Practice is a document which provides the guidelines regarding the standards of integrity, professionalism, and transparency that all MoU, expects of all Port State Control Officers (PSCOs) who are involved in or associated with port state control inspections." (Paris MoU, n.d.)

The code of good practice lists the actions and behavior expected of PSCOs during the inspections and encourages the Officers to use their professional judgment in carrying out their duties. The PSCOs have the obligation to respect the ship, the Master's Authority, and the crew and do not disturb their rest or privacy. They should be polite and comply with the ship's housekeeping rules. It is important the PSCO never be racist, threatening, or dictatorial.

3.11.2 CONDUCT OF INSPECTIONS

At the beginning of the inspection, the PSCO must present the identity card to the Master and also explain for what reason takes places this inspection without exposing the person who makes the complaint. In order to conduct a safe procedure, the PSCO is necessary to wear personal protective clothing and not to walk around the ship unaccompanied by a responsible person. The PSCO should follow the specific procedure of PSC and the convention requirements, and he/she hasn't the right to ask from the crew to do chores which are contrary to the conventions. The appropriate procedure is the crew to present the proper operation of equipment. If the PSCO is not sure about something, he/she seek advice from the flag Administration, the Recognized Organization, the consulting colleagues. At the end of the inspection, the PSCO should exhibit the findings to the Master and indicate the corrective action. The report should be legible, comprehensive, and fully understood. The PSCO should also advise the Master about the procedures in the case of detention.

Furthermore, the PSCO must be independent. Any commercial interest in the ports and in ships they inspect is considered illegal. The same goes for companies which provide services in their ports. He/ she must make decisions only based on the findings, must always obey the rules of their administrations about the gifts and favors, and firmly refuse any attempts of bribery.

3.12. PORT STATE CONTROL INSPECTION REPORTS

When the inspection is completed, the Master receives a document to which the findings refer, and which must be rectified either by the master or by the company. If there is no deficiency the PSCO gives the "Form A" but if there are deficiencies gives two forms, the "Form A" and the "Form B". So, these documents must be retained on the ship for at least 2 years and these forms are uploaded to the database. Samples of reports are presented in the appendix.

3.13.1 DEFICIENCIES

During an inspection, irrespective of the type of Port State Control inspection carried out on board, either it will result in deficiencies or not. Deficiencies are noted when the PSCO verify findings that do not comply with the requirements of a convention and these can compromise the ship in danger, always at the discretion of the inspector. Depending on the seriousness of deficiency, the ship can lead to the detention.

The PSCO may have a checklist with it during the inspection which helps him move on the ship without skipping any important point. Especially, when a ship has a longer inspection, and the process needs to be organized. Depending on the characteristics of the ship, there is a corresponding list control. At the end of the inspection, the PSCO should report the findings of the Master. There are two forms which fill the PSCO. The first includes the details of the ship like the date, the place, and the result of the inspection (Form A), while the second will be completed only if the ship has deficiencies or detention (Form B). These reports should be maintained on board for three years because there is a case to be requested by the next inspector. At the end of the inspection, a copy must be given to the master, one sent to the shore company, and one will keep the PSCO. In case of a detention, two more copies will be sent, one to the Flag of the ship and the other to the Classification Society.

If there are no deficiencies, the Master will file the PSC inspection and will inform the company about that. If there are deficiencies, the Master must inform the company and Classification Society. Also, he must understand the nature of deficiencies and to rectify these in the given timeframe.

There are three options available for rectifying deficiencies. The first option is the best for the Master and it suggests all deficiencies be repaired before the ship sails because the PSCO will have the opportunity to inspect the ship again. The second option indicates that the deficiencies should be rectified in the next port and the PSCO has the obligation to inform the next port. In case the rectifications are routed for the next port, then the ship is characterized and categorized for the port as a high priority (priority I). The flag of the ship and the classification society should be notified. This directive is given in cases where there is no ports infrastructure for repairs and restorations of deficiencies or in cases requested by the ship-owning company and accepted by the PSCO. This direction should consider the condition of the ship, the crew, and the route voyage. The last option mentions that deficiencies will be rectified within 14 days, or if it is ISM-related, within 3 months. This option is used for a deficiency that is not an emergency to need rectification or confirmation by a PSCO before departure. Nevertheless, this ship is a target for future inspections.

3.13.2 CODIFICATION

Categories of deficiencies have been formed and each deficiency has its own code. Specifically, there is a list of comments, which PSCO has, in which records a large number of deficiencies with their counterparts' codes. There is also a corresponding list for the severity of the deficiency and the margin of its recovery, which is identified by a number.

"There will be one or more of these codes for each of the deficiencies.

- Code 0: No action taken
- Code 10: Deficiency rectified
- Code 15: To be rectified at next port
- Code 16: To be rectified within 14 days
- Code 17: To be rectified before departure
- Code 21: Corrective action taken on the ISM system by the Company is required within 3 months
- Code 26: Competent Security Authority informed
- Code 30: Detainable deficiency
- Code 40: Next port informed
- Code 45: rectify detainable deficiency at next port 50 flag state/consul informed
- Code 46: To be rectified at agreed repair port
- Code 47: As in the agreed class condition
- Code 48: As in agreed flag State condition

- ❖ Code 49: As in agreed rectification action plan
- ❖ Code 55: Flag State Administration consulted
- ❖ Code 65: Operation stopped
- ❖ Code 80: Temporary substitution
- ❖ Code 81: Temporary repair carried out
- ❖ Code 85: Investigation of the contravention of discharge provision (MARPOL)
- ❖ Code 95: Letter of warning issued
- ❖ Code 96: Letter of warning withdraw
- ❖ Code 99: Other/Master instructed to…" (Paris MoU, n.d.)

However, there is a question as to whether the PSCO revisits the vessel to confirm the rectification. This procedure depends upon the PSC MoUs and the type and area of deficiency. In some areas this obligation has the classification society, in others only the confirmation of the master is sufficient and, in some others, the PSCO should revisit the vessel to verify the closing of the deficiency.

Code 17 is the most common deficiency which appeared in PSC inspections, and it is necessary to be rectified before the departure. In this case, at some ports, the PSCO is required to revisit the vessel and at others not. In the first case, the master will inform the PSCO after the rectification in order to revisit the vessel. After the reverification master must check that code 10 has been entered next to all code 17. This means that deficiency has been rectified. If a vessel departs without taking into account, the code 17 in that case the vessel is characterized as unseaworthy. For the other codes, the time period for the rectification may be different but the procedure that follows is the same. An example states below:

Sr. No.	Nature of deficiency[1]	Convention[2]/Flag requirements	Action Taken[3]
1	Aux. Boiler safety v/v defective		17/10

Figure 58: Example of rectification of code 17 (SAFETY4SEA, 2017)

3.14.1 DETENTIONS

The PSCO has the responsibility to write down the deficiencies that a vessel may have. But the serious deficiencies can lead a vessel to the detention. When a PSCO determines that a deficiency will be a threat to the environment or could seriously affect the safety of the ship or its crew then it will lead to the detention of the ship. However, if deficiencies are ascertained the PSCO had to decide about the suitable measures to be taken and the PSCO should be sure that these measures will be implemented and if it is a ground for detention.

The Port Authorities inspecting the ship have the obligation to notify, in case of detention, the flag State of the ship. The representative of the flag or by the ship register will get on board and will help to solve the problems. The PSCO examines the rectification measures which proposed by the representative. The approval and the cost of construction are borne by the shipowner. In case that the ship needs to be inspected again, the cost is paid by the ship, and it can depart after the repayment of the Authorities.

According to the Paris MoU, if a PSCO compels a detention, he/she will consider two criteria: Timing and Criterion. In timing the unseaworthy ships will be detained in the first inspection, and they will remain in port for as long as it takes. Secondly, the criterion mentions that the ship will be detained if the PSCO finds serious deficiencies and it is necessary the PSCO to return in order to verify that these deficiencies have been rectified before the ship leaves the port.

When the inspector finds deficiencies in the following and considers the other deficiencies, is seriously considering the case of a detention ship. First of all, the ship is required to have the valid certificates and documents. Secondly, the ship is obliged to have the crew which required under the safe manning certificate.

The check if the ship and crew are able to make the next voyage includes the following:

1. Perform the voyage safely
2. Safely handle, transport, and monitor the condition of the cargo
3. The engine room is safe to operate
4. Maintain proper propulsion and steering
5. To effectively extinguish fires in any part of the ship if required
6. To exist the possibility to leave the ship safely and quickly if required
7. To prevent environmental pollution
8. Maintain the stability
9. Maintain the required tightness
10. To have the ability to communicate with the crew
11. To ensure safety and hygiene conditions
12. In case of an accident should support it with the optimum information

Any of these deficiencies could lead the ship to detention. It is up to PSCO to decide if he/she will give a code of 17(pre-departure rectification) or 30(detention). A detention of the ship can be achieved with a deficiency code which is less serious in nature.

Furthermore, a very important part of the detentions' characteristics is the list of deficiencies which grouped under relevant Conventions and/ or Codes could justify the detention of the ship. This list includes:

1. "The lack of valid certificates and documents as required by the relevant instruments. In this category, there is an exception for the ships which have the flag of State without being a party to a Convention or not having implemented another relevant instrument. These ships have the possibility not to carry these certificates but if in applying the "no more treatment" clause, substantial compliance with the provisions must be required before the ship sails.
2. The areas under SOLAS
   - Failure of proper operation of propulsion and other essential machinery, as well as electrical installations;
   - Insufficient cleanliness of the engine room (excessive quantity petroleum and oil mixtures in water collectors, pollution from pipeline insulation oil, malfunctioning systems pumping of water collectors);
   - Failure of the proper operation of the main and auxiliary steering gear;
   - Absence, insufficient capacity or serious deterioration of personal lifesaving appliances, survival craft, and launching arrangements;
   - Absence, non-compliance, or substantial deterioration to the extent that it cannot comply with its intended use of fire detection system, fire alarms, firefighting equipment, fixed fire extinguishing installation, ventilation valves, fire dampers, quick closing devices;
   - Absence, substantial deterioration, or failure of proper operation of the cargo deck area fire protection on tankers;
   - Absence, non-compliance, or serious deterioration of lights, shapes, or sound signals;
   - Absence or failure of the proper operation of the radio equipment, taking the provisions of SOLAS into account;
   - Absence of corrected navigational charts, and/or all other relevant nautical publications necessary for the intended voyage, taking into account that type-approved electronic chart display and information system (ECDIS) operating on official data may be used as a substitute for the charts;
   - Absence of non-sparking exhaust ventilation for cargo pump-rooms;
   - Serious deficiencies in the operational requirements (PSCC Instruction Guidance on procedures for operational controls);
3. The areas under the IBC (International Bulk Chemical) Code
   - Transport of a substance not mentioned in the Certificate of Fitness or missing cargo information;
   - Missing or damaged high-pressure safety devices;

- Electrical installations not intrinsically safe or corresponding to code requirements;
- Sources of ignition in hazardous locations;
- Contraventions of special requirements;
- Exceeding of maximum allowable cargo quantity per tank;
- Insufficient heat protection for sensitive products.

4. The areas under the IGC Code (International Code for the construction and equipment of ships carrying Liquefied Gases in Bulk)
    - Transport of substance not mentioned in the certificate of Fitness or missing cargo information;
    - Missing closing devices for accommodations or service areas;
    - Bulkhead not gastight;
    - Defective air locks;
    - Missing or defective quick closing valves;
    - Missing or defective safety valves;
    - Electrical installations not intrinsically safe or not corresponding to code requirements;
    - Ventilators in cargo area not operable;
    - Gas detection plant and/or toxic gas detection plant defective;
    - Transport of substances to be inhibited without valid inhibitor certificate.
5. The areas under LOADLINES
    - Significant areas of damage or corrosion or pitting of the plating and associated stiffening in decks and hull effecting seaworthiness or strength to take local loads, unless proper temporary repairs for a voyage to a port for permanent repairs have been carried out;
    - A recognized case of insufficient stability;
    - Absence of sufficient and reliable information, in the approved form, which by rapid and simple means enables the master to arrange for the loading and ballasting of his ship in such a way that a safe margin of stability is maintained at all stages and varying conditions of the voyage, and that the creation of any unacceptable stresses in the ship's structure is avoided;
    - Absence, substantial deterioration or defective closing devices, hatch closing arrangements, and water tight doors;
    - Overloading;
    - Absence of or impossibility to read the draught mark.
6. The areas under Annex I to MARPOL
    - Absence; serious deterioration or failure of proper operation of the oily-water filtering equipment, the oil discharge monitoring, and control system or the 15 ppm alarm arrangements;
    - Remaining capacity of slop and/or sludge tank insufficient for the intended voyage;
    - Oil record book not available;
    - Unauthorized discharge bypass fitted;
    - Survey report file missing or not in conformity with the double hull and double bottom requirements.
7. The areas under Annes II to MARPOL

- Absence of the P&A Manual;
- Cargo is not categorized;
- Lack of the cargo record book;
- Transport of oil-like substances without satisfying the requirements;
- Unauthorized discharge by-pass fitted.

8. The areas under Annex III to MARPOL
   - Absence of a valid Document of Compliance for carriage of dangerous goods (if required);
   - Absence of a Dangerous Cargo manifest or detailed stowage plan before departure of the ship;
   - Stowage and segregation provisions of the IMDG Code Chapter 7.1 and 7.2 are not met;
   - Ship which carries dangerous goods, not in compliance with the Document of Compliance for carriage of dangerous goods of the ship;
   - Ship is carrying damaged or leaking dangerous goods packages;
   - Ship's personnel assigned to specific duties related to the cargo are not familiar with those duties, any dangers posed by the cargo, and with the measures to be taken in such a context.
9. The areas under Annex IV to MARPOL
   - Absence of a Sewage treatment system
   - Not functioning Sewage comminuting and disinfecting system
   - Absence of a Sewage discharge connection
10. The areas under Annex V to MARPOL
    - Absence of the garbage management plan;
    - No garbage record book available;
    - Ship's personnel not familiar with disposal/discharge requirements of the garbage management plan.
11. The areas under Annex VI to MARPOL
    - See PSCC Instruction Guidelines for the Port State Control inspections for compliance with Annex VI of MARPOL regulations for the prevention of air pollutions from ships.
12. The areas under STCW
    - Failure of navigational or engineering watch arrangements to conform to the requirements specified for the ship by the flag State Administration;
    - Absence in a watch of a person qualified to operate equipment essential to safe navigation, safety radio communications, or the prevention of marine pollution;
    - Inability to provide for the first watch at the commencement of a voyage and for subsequent relieving watches persons who are sufficiently rested and otherwise fit for duty.
13. The areas under MLC,2006
    - See PSCC Instruction Guidance for inspection on Maritime Labour Convention, 2006 and Guideline for the Port State Control Officer on the inspection of hours of work/rest and fitness for duty.
14. The areas under AFS Convention

- See PSCC Instruction Preliminary Guidelines for Port State officers on control of Anti-Fouling Systems (AFS) on ships." (Paris MoU, n.d.)

Specifically, the deficiencies related to the SOLAS, due to the nature of this Convention, it is easier to create the ground for detention. For example, deficiencies like the failure of proper operation of the propulsion or the failure of the proper operation of the emergency generator, the failure of the proper operation of the main and auxiliary steering gear, or substantial deterioration or failure of proper operation of life-saving or firefighting equipment and many more.

The detention procedure is simple. The PSCO compiles the notice of detention (a sample is presented in the appendix) for the master and sends this form to the flag and to classification society of the vessel. The master is obliged to notify the flag State if the vessel is detained after the inspection by the port state.

When the deficiencies are provoked by accidental damage suffered by the ship during the trip, must be considered the contract in which pertain to the ship's damage. A detention order cannot be given under the following conditions. Firstly, the flag of the ship has been apprised. The proper inspector of the flag State has been notified or the Recognized Organization (RO) which is responsible for the publish of the corresponding certificate. Before the arrival, the master or the shipping company has submitted to the Authority Port details of damage conditions and information on communication with the ship's flag. The last is the appropriate corrective measures have been taken in accordance with the instructions of the Authority Port State and in consultation with the ship's flag. According to the previous conditions the ship will not be in detention. Otherwise, the ship will be placed in detention and attributed by the PSCO to the previous accident.

3.14.2 BANNING

"Banning" means refusal of access and it occurs when a port denies entry to a particular ship. In case of repeated detentions on a ship, the port authority considers the ship dangerous and decide to take measures against him. Especially, it prohibits the entry in the port and in all the ports which are pertained to the same MoU. The master, the shipowner, the flag of the ship and the classification society be informed in writing of this decision by the Port Authority. According to the Paris MoU region there are three serious reasons to characterize one ship “banning”. Firstly, ships with flag which belongs in the grey list and have been carried out more than two detentions in the last 24 months or ships whose flag belongs to the black list and have become more than two detentions in the past 36 months within the limit’s jurisdiction of the regional agreement. Secondly, if a ship jumps a detention and thirdly, if a ship does not call at the agreed repair yard following a detention. Prohibition of access to the area of jurisdiction of the regional agreement enters into force immediately upon departure from the port or anchorage. An exception is the case where a ship has due to force majeure or overriding safety reasons or due to minimization of the risk of pollution. Thus, in these cases only, it is possible to be allowed in by the competent authority of a Port State.

In order to have the ban lifted, the company must address a formal request to the port state authority of the member state that imposed the ban. Moreover, it is necessary the document from the flag State which proves that the ship complies with all the provisions of the applicable international conventions and secondly it needs the document from the classification society which confirms that the ship complies with the class standards.

If the ship is loaded with a second ban, the suspension will be after 12 months and in the case that the ship is loaded with a third ban, the ban will be suspended after 24 months, and it must apply certain conditions. Initially, the ship does not have a low-ranking flag, the government certificates and class certificates should be issued by recognized organizations, the ship-owning company should be highly efficient, and the requirements of the Port Authority should have been covered. If the period of 24 months has passed or if there is a fourth ban, then it is permanent without the possibility of suspension. Finally, the company has a right of appeal against the banning in accordance with the port state national legislation.

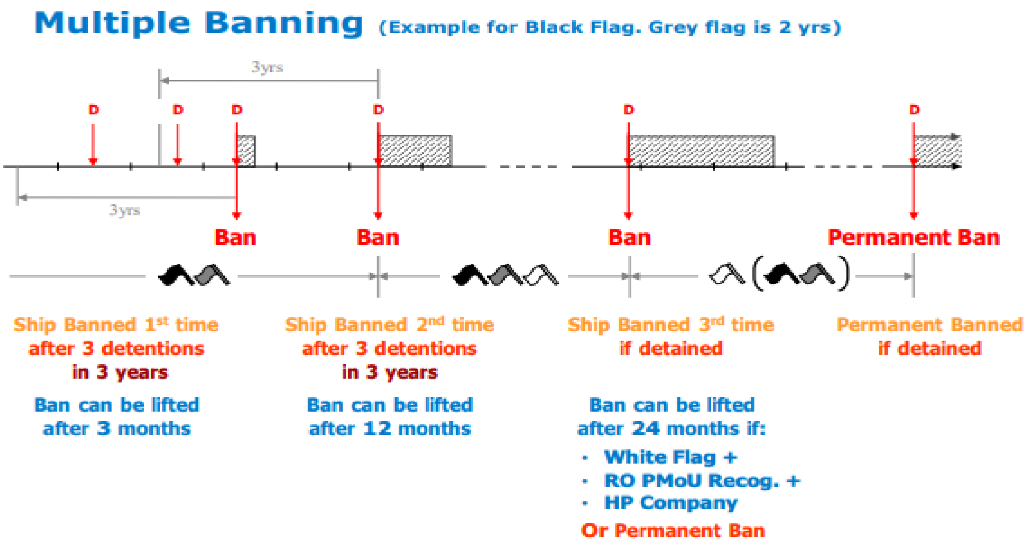


Figure 59: Graphic display of multiple banning (Paris MoU, n.d.)

3.14.3 DETENTION APPEALS

The right to appeal against the order will also be mentioned in this chapter. The PSCO has the obligation to inform the Master of this privilege. The right of appeal against a detention can be conducted by the owner or the operator or his representative. An appeal will not cause the detention to be suspended. The Master should inform about this right. Every MoU has its own detention procedure. The Master or the company has the option to use the official national procedure to appeal directly with the Port State against the detention order. If the owner does not deserve to follow the national appeal procedure, he/she needs to send his grievance to the Flag State or the Recognized Organization. The Port State is obliged to accept and assess this decision and be in constant contact with the Flag State and R.O. In case that the Port State accepts and amend the detention, it should notify the Paris MoU database and the Secretariat. If the results of the investigation do not satisfy the Flag State or the R.O, then, in a period of 120 days after the release date, it should be sent a request for review with all relevant information to the Secretariat. The Review Panel, which will be composed of the Secretariat and the corresponding MoU Authorities, will analyze all the features of the inspection which are derived from the Flag State, the R.O., and the Port State. The final decision will be made within 30 days, after the request and all related parties will be informed. In case that the review panel vindicates the Flag State or the R.O., the Port State is obliged to revise the detention order and adjust the inspection data in the database. The procedure of detention appeal is a common phenomenon and many ship owners use this right because if the vessel is detained, it is too difficult to hire because no one wants a ship with such a detention history. Moreover, the hire will be on low freight rate and then this ship will be financially unprofitable. There will be damage to this company. All this information of low-performing ships is published in the database of the PSC MoUs and the ship may be blacklisted.

3.14.4 CLASSIFICATION SOCIETY

The Recognized Organizations are graded by PSC inspections and ranked in annual lists corresponding to what happens to flags. The results that are valid for their ranking concern the last three years. The Classification Societies are classified into high, medium, low and very low level. Also, there are some that they do not include in the list because it needs to have at least 60 inspections in the last three years.

Therefore, a list is created annually where it records the Recognized Organizations and next to each other, the inspections, the detentions and the limits for the lower and higher area and the “factor” EF.

The Classification Society is following PSC inspections issues very closely because their ranking is related to them. Many areas of shipping such as shipowners, flags, charterers and many more, are consulted this ranking for their decisions. The choice is determined by its position in the list which appears in the annual reports of the MoUs. The RO who are high on the list creates a sense of reliability and many shipowners prefer them. Respectively, charterers choose ships and companies which are inspected by a high-quality organization. Finally, classification societies depend to a large extent on the flags.

3.15 GENERAL GUIDE TO MASTERS

The Port State Control inspections are vital to the proper and safe operation of the ship. However, in order for inspections to be effective, they should be done unexpectedly to determine that the master and the crew are always ready to cope with any situation. In order to carry out an inspection, many parameters are considered and many times the target area that is to be inspected also plays an important role. When a ship is not inspected, a PSCO may not be available, or the port has not enough resources due to the remote area and it is not easy to travel someone all these miles for only one inspection. Furthermore, if six months have not elapsed since the previous inspection or the ship's schedule is not within the inspection window then the chances of an additional inspection are low. One of the most important factors is the ship's risk profile which forms the general image of the ship. It is, therefore, obvious that the performance of an inspection depends on many parameters. For these reasons no one can accurately predict when the next PSC inspection will be conducted, and the ship is necessary to be always ready for an inspection.

In particular, the master who holds the highest position and is in charge of the whole ship and the crew has increased obligations and responsibilities. The Master should always have the correct statutory certificates available for inspection and should have also available the records of work and rest hours as well as the issues related to the Maritime Labour Convention. Regardless of the procedures and checklists which are provided from the organizations and companies, the Master has the obligation to ensure that these verified by a second person. An exception is the Concentrated Inspection Campaign (CIC) which must be issued by the MoU. In this case environmental issues have the same gravity and impose even greater attention to the Master.

3.16 GUIDANCE FOR COMPANIES

It is obvious that the efficient and the smooth operation of the ship is achieved within the company. The company targets to create the duly and the accurate procedures in order for the ship to succeed in the Port State Control inspection. For this reason, every company should provide a guidance and checklists to the ship for a better preparation.

First of all, the company should ensure and confirm that the ship holds all the necessarily and valid certificates about the ship's seaworthiness and about the crew before the ship begins the duty. Additionally, it is necessary to apply the SMS which gives the proper guidance to the shipboard personnel for the safe operation of equipment and maintenance in order to prevent a potential deficiency. Information related to Port State Control CIC campaigns should be sent to the ship. The information should include CIC checklists, alerts, PSC statistics, downloadable PSC videos and specific details on the most frequent deficiency areas. Moreover, the shore company has the obligation to inform the ship for any change about the Flag State requirements before the ship arrives at specific ports. There are some programs which reduce the risk of detention.

As mentioned in another chapter, in case the ship has any damage to the equipment or has made any corrective action it must report it before entering the port. Furthermore, after the inspection the Master has the right to disagree with any deficiency and he must inform the company. Then the company will be making a formal appeal with the local PSCO Authorities, or it will ask a review process through the appropriate MoU. Always with the support of ship's Flag State or the Recognized Organizations. The local agent has a statutory role for the ship because he/she gives advice for the local regulations and policies.

Another serious issue that arises in the shipping industry is bribery. Bribery and facilitation payments are universally illegal. The distinction between them is that a facilitation payment is a payment aimed at speeding up an already predetermined process. But if this payment is intended to change the outcome, then it means bribes. Today, there are Acts which endeavor to apply a strict policy in order to stop the facilitation payments because it has serious adverse effects in the shipping industry.

3.17. RESULTS

The aim of this research was to demonstrate the needs of the shipping industry about the safety on the ships, the environmental consciousness and the procedures for implementing appropriate practices. The Port State Control inspections is one of the hot topics and most important issues of shipping. Port State Control have an importance for this industry because the target is to prevent possible accidents with extremely damages. These detrimental effects have important environmental, economic and social consequences. Cause and occasion for the application of these regulations was the accident of Torrey Canyon which shocked the whole world. After this tragedy, in 1948 it was signed the International Convention on Safety of Life at Sea. But, almost ten years later, caused another appalling accident with a supertanker, named Amoco Cadiz, which was the determining factor to begin many MoUs and a range of conventions which have a lot of influence in the shipping industry until today. All these strict measures are trying to ensure a better sustainable shipping and this target will be achieved through the procedures of Port State Control. Port State Control conducts inspections to foreign ships in national ports in order to assure that there is not exist any potential danger which could pose the vessel, the crew, the port and the environment at risk. With the support of IMO and ILO were created nine Memorandums of

Understanding and a separate part is the United States Coast Guard. All the MoUs have the same or the similar purpose to ensure that the foreign ships comply with the requirements of international regulations. Also, it should be mentioned that as observed the content of the memoranda have much in common with each other. Every administration in every MoU applies relevant instruments like SOLAS, LOAD LINES 66, MARPOL, STCW 78, COLREG 72, TONNAGE 69 and many more, which assist in conduction inspections and the administrations ensure that there is not any favorable treatment on ships whether the ships fly the flag of a State party to this MoU or not. Also, there are some same annexes in every MoU as Ship Risk Profile, Inspection and Selection Scheme and Reporting obligations for ships. This dissertation performs and analyze the chapter of the Ship Risk Profile for every MoU (or where it exists) and a small reference is made for the PSC in USA. It is obvious that more attention and greater analysis is given to Paris MoU. Furthermore, in an age that the technology evolves in leaps and bounds, every MoU has been created useful databases which contains a wide spectrum of information about the ships and the PSC inspections. It is obvious that each MoU has a useful database but in the dissertation is analyzed only the four most common databases.

According to the annual statistics for every MoU, which come from the databases, from 2010 until today there has been observed a gradually increase in the number of inspections and an overwhelming decrease in the number of detentions. For example, in the Tokyo MoU in 2010 was recorded 25,762 inspections and in 2019 were conducted 31,372 inspections. Also, the number of deficiencies in 2010 were 90,177 and the detentions were 1,411, but in 2019 were 34,924 the deficiencies and 983 the detentions.

Must be mentioned as a detail that most inspections were carried out on bulk carrier ships, but the ships of general dry cargo had the majority of detentions. Corresponding statistics exist in the other MoUs as well. It should be noted that the year 2020 is not included in these statistics due to the pandemic of Covid-19. Following the rapid escalation of the pandemic, restrictions have been gradually expanded and the PSC conducts only the emergency inspections. For this reason, there is not an objective view and the statistics are difficult to be compared with the previous years. Furthermore, it has been proven that the ten most deficiencies related to the certificates and documents, to the safety of navigation, to the lifesaving appliances, to emergency systems, to structural conditions, to the fire safety, to the working and living conditions, to the propulsion and auxiliary machinery, to the radio communication, to the lights, shapes, sounds signals and the most common deficiency which appear in many inspections related to the ISM Code and this is so important because it is a detainable deficiency and every year a lot of ships are detained due to they do not comply with the conventions of ISM Code. Moreover, there are some flags which have a lot of detentions compared to other flags. Theses flags are the Panama, the Belize, the Liberia, Malta, the Marshall Islands, the Russian Federation, the Togo, the Sierra Leone, the Comoros and the Antigua and Barbuda flag. It is noted that the majority of these flags are belonged to the flags of convenience which creates not only a competitive advantage for those ships but also a higher risk in terms of accidents, security or pollution because they do not have stricter safety standards. PSC is often considered as the only line of defense against ships from low-performing flag States. Additionally, all these deficiencies and detentions largely are associated with the performance of Recognized Organizations. It has been observed that classification society of Nippon Kaiji Kyokai (NK/Class NK) related to a big number of deficiencies and detentions in every MoU. Then follows the DNV GL AS, the Bureau Veritas, the Lloyd’s Register and the American Bureau of Shipping. Thus, it is proven that in a deficiency or in a detention an important role has additionally factors.

CHAPTER 4: CLASSIFICATION SOCIETIES

(Edited by Dimitrios Papatheofanous)

4.1. INTRODUCTION

4.1.1 DEFINITION

Classification societies are non-governmental organizations which have been developed to verify that a vessel and all other maritime parties meet the standards related to safety and pollution prevention.

These societies are carrying out statutory inspections on behalf of flag administrations to certify that the regulations of international conventions such as SOLAS, MARPOL and codes like ISM and ISPS are being followed.

Furthermore, classification societies develop rules for the proper operation and maintenance of a vessel’s propulsion, power generation and hull’s strength and condition. For the development of each rule, the class societies are taking into consideration previous experience gained through all these years of classing various vessel’s types combined with the research that is being made regarding the technical requirements.

Those rules are applied both during vessel’s construction and operation. If a vessel is built under a specific class’s rules and regulations, it may apply for a classification of this society. The class can be maintained for a vessel through a variety of periodical surveys. These surveys can either be annual or 5-year.

It is understood that in order for a vessel to maintain its class, it should be well equipped, maintained and manned with a skilled crew and qualified personnel ashore. In case that an incident or damage occurs on a vessel’s hull or equipment, the owner must notify the class immediately. The class then issues a conditional certificate, giving time for rectification to the owner and preventing regulatory bodies (for example the port state control) to detain the vessel.

Although a vessel’s classification and relevant certification indicates that it follows the rules and regulations, it should not be considered as a warranty of its safety and seaworthiness. A classification society may only verify the condition of a vessel and not the way that it is manned, operated or maintained.

Responsible parties other than classification societies that are preserving maritime safety are port state control authorities, shipowners, shipbuilding yards, underwriters, banks financing shipping companies and charterers.

Today, more than 50 organizations are describing their activities as classification service providers. Out of a total of 50 organizations, a large percentage of the global fleet is subject to the classification of 12 of those classification societies, which compile the International Association of the Classification Societies (IACS).

4.1.2 HISTORY

In 1760, all parties related to the shipping industry (shipowners, merchants and captains) were often gathering at the coffee house of Edward Lloyd's to discuss shipping news, make new deals and evaluate the possible rewards and risks for each scheduled voyage. Once a voyage was fixed, then one insurer had to sign a document, stating that in case of a cargo loss, he should compensate the merchant who owned the cargo or the shipowner, a practice known as underwriting.

In order for the underwriters to properly evaluate which of the vessels they were pledging to compensate, they formed the first classification society, known as Register Society, today known as Lloyd's Register (LR). This society's main objective was to class each vessel on an annual basis in the following 3 categories:

G – Good later replaced by 1

M – Middling later replaced by 2

B – Bad later replaced by 3

The above 3-type classification was focused only in evaluating the possible risk and not the vessel's safety or seaworthiness. Half a century later the second classification society was formed in Antwerp and moved to Paris, known as Bureau Veritas (BV). During that time, surveys have been carrying out only by former captains. In 1834, Lloyd's Register started to employ surveyors and compose a general rules guideline, which was published that year. This guideline was referring to the vessel's construction and maintenance.

Once the guideline was published and its common rules were adopted by the majority of the underwriters, other nationalities began forming their own classification societies.

4.2. CLASSIFICATION SOCIETIES

4.2.1 TODAY

Nowadays, the international trade demand is constantly rising and due to the fact that around 80% of that trade is carried by sea (UNCTADSTAT, 2021), it is understood that the vessels number will rise too. In comparison with the year 2005, the global fleet expanded twice its size, and by the end of year 2020, there were 62,100 vessels trading globally (UK Department for transport, 2021). All these vessels have to be classified and evaluated accordingly, in order to preserve the maritime pollution in low levels and the safety of life at high standards. The classification societies are the only organizations that have the right to provide this evaluation will be analyzed below.

4.2.2 LLOYD'S REGISTER (LR)

Formed from the coffee house of Edward Lloyd (1760), a place where shipowners, merchants and captains were gathered to exchange news, experiences and to make deals. The first Register of Ships was printed in 1764, a database in which one could find the condition of a vessel and evaluate if he should proceed with the trade or not. This database was updated on an annual basis, classifying self-propelled vessels with a tonnage of 100 tonnes or more.

Figure 60: Lloyd's Register Logo (Lloyd's Register, 2021)

Presently, Lloyd's Register is considered as one of the most important classification societies, leading the gas tanker fleet (Lloyd's List, 09 December 2020). Lloyd's Register is having 7,559 vessels under its registry with a total capacity of 326,901,373 DW tons (International Association of Classification Societies, 2021). The organization's headquarters are located in the city of London, UK. Having open its own research lab in 2020, Lloyd's Register's focus is on industry's decarbonization, a project which is under development through a collaboration with academics and some ship management companies.

In addition to its fleet's decarbonization, LR is providing classification and compliance services both in marine and offshore industries, consulting throughout a vessel's construction and operation and advising its clients for fleet optimization, emergency response, risk management, fuel testing and fleet management.

Lloyd's Register offices are located in more than 70 countries, providing services for clients based in 182 different countries. Basis the IACS annual review of 2020, the number of exclusive ship surveyors is 1,011 and the organization's plan approval engineers are 438.

4.2.3 BUREAU VERITAS (BV)

Bureau Veritas was established in Antwerp, Belgium, with a mission to classify merchant vessels in order to assist insurers for proper evaluation and to ensure the value of the property of the shipowners and the lives of the crews. In 1829 the classification renamed to Bureau Veritas and in 1833 the organization's headquarters moved to Paris, France.

Figure 61: Bureau Veritas logo (Bureau Veritas, 2021)

Today, Bureau Veritas has a total of 9,389 vessels in its registry, with the most common types of vessels (tankers, bulk carriers and containers) to form a 30% of its fleet. BV is oriented in other types of vessels, such as dredgers, cruise ships, offshore service vessels and tugboats. Further to the usual services of a classification society, Bureau Veritas also provides marine fuel testing, cyber security and offshore units (drilling, FLNG, FPSO, FSRU) services. The society is currently the employer of 931 ship surveyors and 308 plan approval engineers (International Association of Classification Societies, 2021), having 180 survey stations globally (Bureau Veritas, 2021).

4.2.4 REGISTRO ITALIANO NAVALE (RINA)

The Italian classification society formed in 1861 in Genoa under the already existing British and French standards. Currently, RINA has a total of 3,977 vessels. Classification's bigger sector are the bulk carriers (dry), counting 400 vessels with almost 26 million DWT tonnes (International Association of Classification Societies, 2021).

Figure 62: Registro Italiano Navale logo

RINA is providing classification and statutory services for all types of vessels with its 523 surveyors an over 200 offices worldwide. In 2020, during COVID-19 outbreak, the Italian classification society was the first class that carried out statutory and intermediate surveys remotely (Sam Champers, 11 June 2020). In particular, drones were used in areas that needed a close-up survey, such as a thorough inspection inside cargo and ballast tanks.

4.2.5 AMERICAN BUREAU OF SHIPPING (ABS)

Founded in 1862 in New York as American Shipmasters' Association (ASA), with the scope of evaluating and certifying to the shipowner the captains for vessels' operations during the Civil War. Those vessels' which were under the command of ASA approved shipmasters would be better covered by insurance. In 1890 the ASA issued the "ABS rules for building and classing steel vessels" (American Bureau of Shipping, 2021), a guideline that exists and is updated to this day. In 1898 the organization was renamed to American Bureau of Shipping (ABS).

Currently, the American Bureau of Shipping's fleet is a total of 7,956 vessels with a sum of almost 392 million deadweight tonnes, the second biggest deadweight tonnage class (International Association of Classification Societies, 2021). The American classification society is having in its registry the biggest share in the fleet of tankers, a very important section in shipping. Among its objectives, ABS has provided insight in cooperation with big shipping companies to prepare the shipping industry for decarbonization.

Figure 63: American Bureau of Shipping logo (American Bureau of Shipping, 2021)

The American Bureau of Shipping is having 1,309 exclusive ship surveyors and 566 plan approval engineers, providing services to 70 countries worldwide with 200 offices.

4.2.6 DET NORSKE VERITAS (DNV)

DNV was formed in 1864 in Norway, to provide evaluation for the Norwegian merchant vessels. In 2012, DNV was merged with Germanischer Lloyd (GL), after the approval of all other classification societies, and renamed to DNV GL. In 2017 the biggest investor of GL sold his share to DNV and the classification's final name was set out as DNV.

Figure 64: Det Norske Veritas logo (DNV, 2021)

The Norwegian class is on top of the other societies basis the number of vessels and gross tonnage. Particularly, it's fleet lists 8,712 vessels and a total of 276 million gross tonnes. DNV leads in the container vessels sector having a total of 1,734 containerships.

Among its services, DNV provides advisory support, offshore classification and digital solutions. It also focuses on alternative fuels, studying and comparing fuels such as ammonia or hydrogen that will be used to pave the way for decarbonization (DNV, 2021). DNV is currently employing 1,430 exclusive ship surveyors and 560 plan approval engineers, having 350 offices in more than 100 countries worldwide (DNV, 2021).

4.2.7 NIPPON KAIJI KYOKAI (NKK)

The Japanese classification society was founded in November 1899 in Tokyo, then called Teikoku Kaiji Kyokai (TKK, the Imperial Marine Association) (ClassNK, 2021). The purpose of its establishment was to provide the regulations and the development of Japan's shipping and shipbuilding industries. In 1919, the TKK collaborated with three classification societies, quite recognizable for the time, the British, the Italian and the American, thus gaining international recognition.

Figure 65: Nippon Kaiji Kyokai logo (ClassNK, 2021)

At the end of World War II, it was renamed to Nippon Kaiji Kyokai (NKK, 1946) and as the Japanese shipbuilding industry began to recover, the Japanese classification society began to increase its fleet and regain its worldwide recognition.

Today, the Japanese classification society has the most, by far, bulk carriers in its registry. Particularly, its fleet consist of 7,559 vessels, with more that 50% being bulk carriers. The NKK total in bulkers gross tonnage is almost 165 million tonnes (International Association of Classification Societies, 2021). The class' exclusive ship surveyors are 1,183 and its plan approval engineers 193, having worldwide coverage.

The Japanese classification society is engaged in the study of carbon recycling on ships and the design of ships that will consume liquefied ammonia.

4.2.8 RUSSIAN MARITIME REGISTER OF SHIPPING (RS)

The foundations for the establishment of the Russian classification society have existed since the beginning of the 18th century, when there was a need for technical inspection of the ships of the Russian fleet. The year of founding of the Russian classification society is 1913 (RS Class, 2021) and in 1915 the organization recorded and published it's first rules for the construction of seagoing steel ships. In 1924, due to political matters, it was renamed as USSR Register and 11 years later, in 1935, the Russian Classification Society was recognized by the IACS. In 1992, the organization was renamed to its current name, Russian Maritime Register of Shipping (RS).

Figure 66: Russian Maritime Register of Shipping logo (RS Class, 2021)

Today, the Russian classification society provides, in addition of a class' main services, the monitoring and supervision of the construction of arctic or polar vessels. The organization has also partnered with a company that manages ships sailing in the Arctic, in which it will take data from ship voyages and analyze them to increase the safety of ships traveling in these difficult conditions (Safety4Sea, Editorial Team, 14 June 2021). Russian Register of Shipping currently has 663 exclusive ship surveyors and 73 plan approval engineers and 2,432 vessels with a total gross tonnage of 12,6 million tonnes (International Association of Classification Societies, 2021).

4.2.9 POLISH REGISTER OF SHIPPING (PRS)

The Polish classification society was created in 1936 and became a member of IACS in 1972. Almost 30 years later, in 2000, IACS ended its cooperation with the Polish classification society after the sinking of a vessel under its registry, the Leader L. On

2011 PRS joined IACS again. The classification society employs 68 exclusive ship surveyors and 39 plan approval engineers. The vessels under its registry are 430 with a total gross tonnage of 9 million tonnes.

Figure 67: Polish Register of Shipping logo (PRS, 2021)

4.2.10 CROATIAN REGISTER OF SHIPPING (CRS)

The Croatian classification society was founded in 1949 and became a member of IACS in 2011. Today the organization has 337 ships registered with a total of 1,8 million gross tonnes. CRS offices are located mainly in the Balkans.

Figure 68: Croatian Register of Shipping logo (CRS, 2021)

4.2.11 CHINA CLASSIFICATION SOCIETY (CCS)

China classification society was established in 1956 and joined the IACS in May 1988. Currently, the Chinese classification society has the sixth biggest fleet under its register, with the 50% of the total tonnes being dry bulk carriers. Specifically, the Chinese register is surveying almost 4,000 vessels, with a total gross tonnage of 120,6 million tonnes (International Association of Classification Societies, 2021).

The speed of development of this classification society is mainly based on the development of Chinese shipping companies, for which it is the exclusive classification society.

The Chinese classification society recently signed a memorandum of cooperation with the port of Tianjin and the Wartsila company, with main purpose the optimization of the effectiveness and safety within the port, in terms of the exploitation of the new type of tugs (Reporter, 30 November 2021).

Figure 69: China classification society logo (CCS, 2021)

The company will provide operational data to the classification society in order to create the first guidelines for the management and maintenance of smart tugs in ports.

The Chinese classification society has 1,002 exclusive ship surveyors, 233 plan approval engineers and 120 offices located across the globe.

4.2.12 KOREAN REGISTER (KR)

The history of the Korean classification society begins with its founding in 1960. In 1988 its fleet reaches 10 million gross tonnes and becomes a member of IACS. Today, the classification society lists almost 2,000 vessels, with a total of 69 million gross tonnes and 59 offices around the globe. More than 30% of its fleet are dry bulk carriers. The organisation’s plan approval engineers are 105 and its exclusive ship surveyors 587.

Figure 70: Korean register logo (Korean Register of Shipping, 2021)

The Korean classification society was the first among the members of IACS to approve the construction of the largest liquified hydrogen carrier, a vessel that will carry 20,000 cubic meters of the new fuel trend (Seatrade Maritime News, 26 October 2020).

4.2.13 INDIAN REGISTER OF SHIPPING (IRS)

The Indian Classification Society was established in 1975 by the Government of India and joined the IACS as a full member in 2010. Currently, the classification society has 140 exclusive ship surveyors, 64 plan approval engineers and 1,028 vessels under its registry. The organization's biggest section in gross tonnage are the tankers, having more that 50% of its total tonnage and it is recognized by 43 flag authorities (International Association of Classification Societies, 2021).

Figure 71: Indian register of shipping logo (IRClass, 2021)

4.2.14 HELLENIC REGISTER OF SHIPPING (HRS)

The Hellenic Register of Shipping was established in 1919 in Greece, dedicated to the safeguarding of life and property at sea, the prevention of marine pollution and the quality assurance in industry. This Classification Society in not an IACS member but was collaborating with several Classification Societies under IACS, for the issuance of statutory certificates. Several of the Hellenic Register of Shipping activities are listed below:

- Inspections for a vast variety of ship's types and relevant issuance of trading and statutory certifications (on behalf of 28 flag administrations).

- Maintenance surveys of all critical machineries related to the vessel's operations.
- Supervision and guidance for special projects such as new-buildings or conversions. Particularly, the Hellenic Register of Shipping was the Classification Society, which was supervising the new-building progress of the vessels built in Greek shipyards for the Hellenic Navy.
- Safety Management procedures monitoring and assessment both for a vessel's safety management plan and for a company's ISM Code.

Figure 72: Hellenic Register of Shipping Logo (Hellenic Register of Shipping, 2022)

Currently, the Hellenic Register of Shipping has under its registry many yachts and small craft vessels.

4.3. THE INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES (IACS)

4.3.1 ORIGINS AND RECOGNITION

The international association of classification societies was based after a recommendation during the International Load Line Convention (1930), suggesting that the already existing classification societies had to cooperate in order to ensure as much consistency as possible with regards to the freeboard's strength.

9 years later, based on this conference, the Italian classification society (RINA) hosted the first conference of the great classification societies until then. During this conference, the 7 biggest classification societies agreed to extend their cooperation.

In the year of 1968, the international association of classification societies (IACS) was formed, which consisted of 7 members, the Italian (RINA), the American (ABS), the French (BV), the Norwegian (DNV), the German (GL), the British (LR) and finally the Japanese (NK) classification society.

Shortly after its establishment, the association was internationally recognized for its technical knowledge and its experience gathered all these years during each of its member's activities. Thus, in 1968 the International Maritime Organization gave to IACS its consultative status, a status valid to this day. IACS is the only non-governmental entity having the authority to set and enforce rules as an observer.

4.3.2 IACS MISSION AND VALUES

IACS is an association, currently consisting of 12 classification societies, with primary scope the establishment, the promotion, the review and the development of minimum technical standards along with the vessel's inspection, maintenance, design and construction.

It also aims to support international regulators and organizations in enforcing legislation and industry standards in the design, construction and subsequent operation of the vessel, while improving maritime safety and pollution prevention.

The association manages to achieve these goals by having the following values (International Association of Classification Societies, 2021):

- **Leadership**: The ability to be ahead and collaborate with international organizations
- **Technical knowledge**: Through individual and collective technical expertise and experience, it manages to develop, adopt and implement technical regulations and requirements, which reflect the common practice and the variability of social requirements, while promoting new technology and innovation
- **Performance monitoring**: Members' commitment to setting and adhering to the highest global quality standards.
- **Transparency**: Advising on the implementation of regulations, interpreting and enchasing them (when applicable), in order to develop practical solutions in collaboration with other parties.

The Association's effort in difficult circumstances guarantees the maritime industry's ongoing safe operation now and in the future.

4.3.3 GOVERNANCE STRUCTURE

The association is governed by the council, which consists of a senior executive of each classification society. The General Policy Group (GPG), which reports to the council and is made up of a senior member of every classification society, is in charge of putting the council's general recommendations into action.

So far, the Chair of the general policy group was based on a rotational system, but in 2020, the association decided to change this policy and differentiate the Chair’s procedure. Thus, to facilitate decision-making and consolidate the association's policies, the chair-making process will take place through elections. The members of the council will elect a member who will hold this position for the next 3 years, and along with that a supportive technical committee. In this way, the union, in addition to expanding its representation over time, succeeds in bringing a team of highly qualified experts closer to the International Maritime Organization (IMO). With these new changes, the international association of classification societies aims to identify potentially upcoming problems earlier and extend the time in which it can solve them. The association consists of even smaller categories of departments, responsible for different sectors within the maritime industry. Such sectors are:

- EU and global based standards expert groups, dealing only with regulations for decarbonization goals
- An EEDI (energy efficiency ship index) joint working group, promoting the use of less polluting engines in shipping
- Expert groups for various matters such as safety of surveyor, MASS (maritime autonomous surface ships), materials and welding, management systems, formal safety assessment and data
- Joint working groups dealing with cyber security systems and anchoring systems
- One small group specialized in coatings and one for quality policies
- One panel dealing with all vessel’s important aspects, such as hull, surveys, safety, machinery, environmental and cyber systems

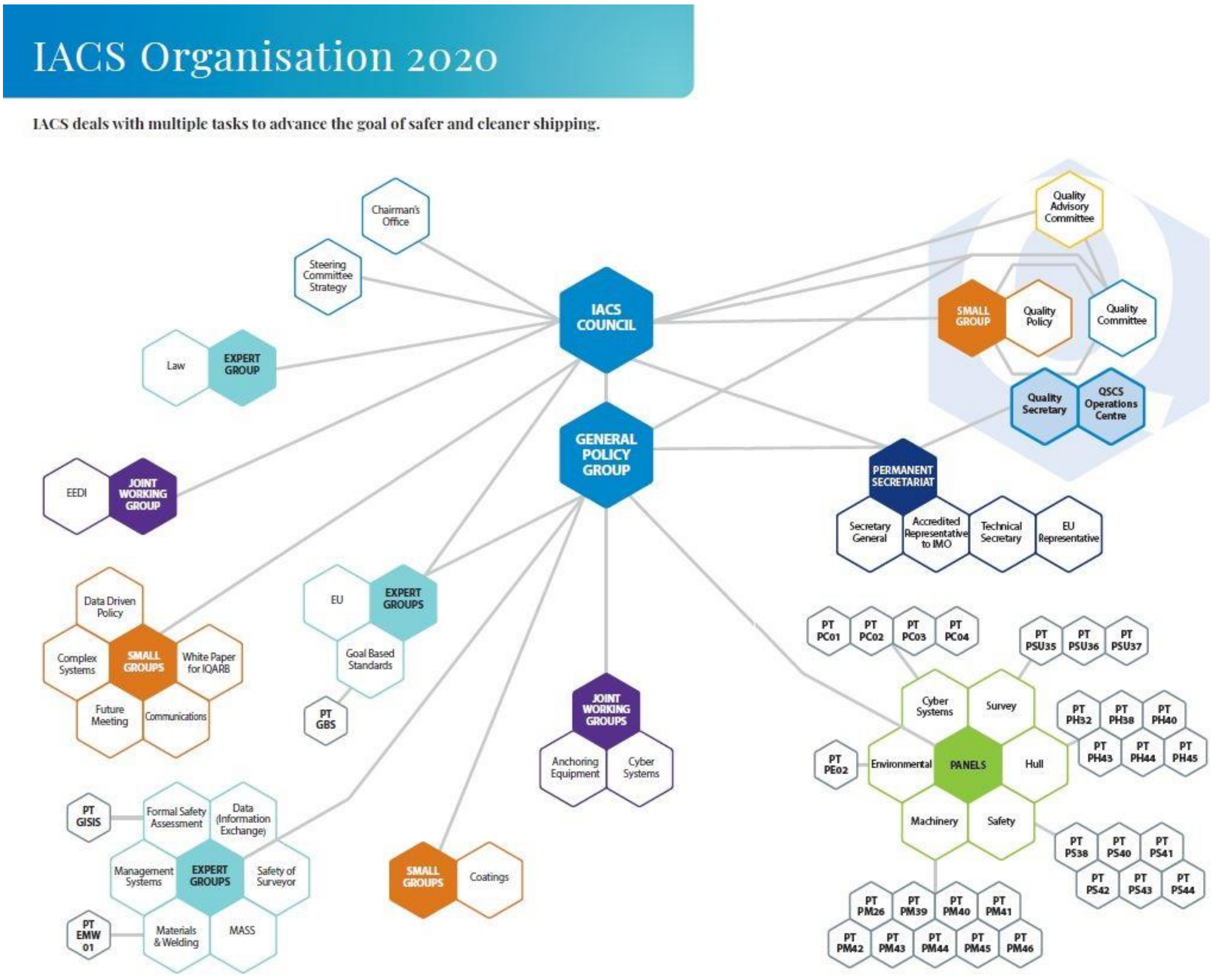


Figure 73: IACS organization 2020 (International Association of Classification Societies, 2021)

4.3.4 IACS MEMBERSHIP CRITERIA

Joining the international association of classification societies requires compliance with certain criteria, which are listed below:

Criterion 1 – Proof that the organization requesting membership in IACS has relevant qualification validating that it is a class organization, as specified under IACS' Annex 4.

Criterion 2 – The organization must follow the quality system certification scheme (QSCS), which validates that each classification society has built its unique management system, meeting the IACS requirements in regard to the internal quality.

Criterion 3 – The classification society should be capable of emerging, implementing, sustaining and reforming rules and regulations written in the English language on a regular basis. These regulations should cover all aspects of a vessel's classification process, such as vessel's design approval and vessel's periodical or construction surveys.

Criterion 4 – The classification society should have the ability to provide surveys and periodical surveys during a vessel's construction and operation under the requirements of IMO, ILO and flag states**.**

Criterion 5 – The classification society should have a sufficient number of exclusive ship surveyors to meet the need for construction projects and surveys for ships in service.

Criterion 6 – The classification society must demonstrate that it has the experience to monitor and evaluate plans for the construction of the ship or its modification under the international regulations of the IMO and ILO conventions.

Criterion 7 – The human resources and expertise which composes the relevant society's departments should be complying with the size of the classified vessels under its registry.

Criterion 8 – The classification society should have its own technical ability to contribute to the development of minimum regulations and requirements in collaboration with IACS.

Criterion 9 – The classification society should contribute to IACS with its own resources on an ongoing basis as described in criterion 8.

Criterion 10 – The classification society's classed vessels should be in accordance with IACS resolutions, as defined in Annex 4

Criterion 11 – The classification society should grant written confirmation from the IMO safety committee that its rules and procedures meet the criteria of the "International Goal-Based Ship Construction Standards for bulk carriers and oil tankers (SOLAS Reg.II-1/3-10, IMO Resolution MSC.287(87))".

4.3.5 IACS MEMBERS RIGHTS AND OBLIGATIONS

Once a classification organization enters the international association of classification society (IACS), it has the below rights (International Association of Classification Societies, June 2017):

- The organization can be considered as an IACS member
- - The organization has the right to attend and vote in all Council and General Policy Group meetings and deliberations (GPG)
- The organization has voting rights and can participate in all Working Groups
- The organization has voting rights and can participate in the Quality Committee
- The organization can join the IACS delegation to sessions at the International Maritime Organization (IMO).

Also, a member of the International Association of the Classification Societies has the below listed commitments:

- - Each member shall make a financial contribution to the IACS on equal financial terms with the other members of the association
- Each member should at all times satisfy the IACS membership standards
- Complete the "Membership Application and Periodical Verification of Existing Members verification process (at Annex 1)"
- Members should comply with the IACS procedures
- Each member should participate in the IACS Council Chair elections
- Members should comply with the IACS resolutions

4.3.6 SUSPENSION AND WITHDRAWAL PROCESS

When the council considers that a member of the association does not comply with membership criteria, then the following procedure commences for the member's suspension or withdrawal (International Association of Classification Societies, June 2017):

- The IACS council notifies with a written statement the particular member that the suspension process has been initiated
- The notification declares the reasons why the procedure was initiated and provide a time window on which the member must comply and take actions for the rectification of the non-compliance
- If the time limit elapses and the Council notices that the member has not rectified the remark, then it may suspend the member from the association
- A reasonable time period shall be given to the member by the suspension decision during which the member should rectify the non-conformity
- The suspension's verdict will not be activated unless the time of appealing to the Independent Appeal Board has passed, or unless the IACS Member notifies the IACS Council that it has submitted interim actions in compliance with the Appeal Board Rules of Procedure
- Not any public announcement shall be made from either IACS ltd or IACS member, until the suspension decision takes effect
- The obligations of membership for the suspended IACS member continue to apply, except for the voting right.

- If the IACS suspended member does not succeed into rectifying the non-conformity, then IACS council may take the decision of the member's withdrawal, stating the reason of such decision
- Not any public announcement shall be made from either IACS ltd or IACS member, until the withdrawal decision takes effect
- An IACS member whose membership is withdrawn, may apply again to join the association only if 12 months have passed from the time that the association took the withdrawal decision.

4.4. CLASSIFICATION PROCEDURES

4.4.1 ASSIGNMENT OF CLASS

A ship is classified when all inspections have been completed satisfactorily, ensuring that the ship complies with the association's international rules. This assignment is provided under the below listed circumstances:

- After a new constructed vessel's commissioning and basis that all needed surveys have been completed successfully
- Upon completion of an existing vessel's successful survey, carried out in accordance with IACS international rules for vessel's that transferring their class (between IACS members)
- Upon completion of an existing vessel's successful survey, not classified yet under an IACS association member

4.4.2 MAINTENANCE OF CLASS

To maintain its class, a ship should be inspected regularly through several surveys. Some of those inspections are the annual survey (carried out on a 12-month basis), the intermediate survey (carried out on a 2.5 year basis) and the special survey (also called class renewal survey, carried out once every 5 years). Also, the docking survey (which can either be carried out in dry-dock or in-water with the assistance of divers) evaluating the condition of the vessel's hull, the tail shaft survey confirming that the condition of the propeller is operating satisfactory, the boiler survey and the machinery survey checking the condition of various critical machineries onboard. Each of the above mentioned surveys is performed regularly, depending on the date of its last completion. Some of the surveys are required to be carried out on an annual basis, and some are less frequent, such as the special survey, which can be carried out either every 5 years or every 2.5 years, subject to vessel's age.

All the surveys are ensuring that the vessel is complying with relevant requirements and that each of the critical categories is in accordance with the classification societies regulations. It is the owner's duty to maintain the vessel's condition at a adequate conditionl, sufficient enough to keep the class of the vessel maintained.

The range and the scope of an inspection is subject to the vessel's condition and equipment (IACS, 2020). In case that the surveyor determines that the ship's state or a part of its systems is insufficient or defective, then a further examination will be required.

4.4.3 SUSPENSION OF CLASS

The classification society may suspend the class of a vessel for the following reasons:

- In case that a vessel's operation and maintainance are complying with the classification's rules and requirements
- When a vessel has less freeboard than assigned
- When a damage occurs to a vessel and the owner fails to inform the class and request a survey on the defected equipment
- When modifications are carried out on the vessel for critical equipment (indicated by the class) without a surveyor's witnessing

Furthermore, a class may be suspended directly for the following:

- When the renewal survey is not complete within the time frame given by the class
- When the intermediate or the annual surveys are not complete by the given due date

A suspension of the above reasons will have effect until the vessel carries out the required surveys and any further survey that the class can consider necessary. Some additional circumstances that may lead to consideration of a vessel's class suspension are the below:

- When a condition of class (also called a class recommendation) cannot be rectified within the due date given by the classification society, unless it is agreed with the classification society or it has provided relevant documentation in order to acquire a postponement
- In the cases that the surveys are not complete within the time window given from the class status
- When the classification society considers that the vessel cannot maintain it's class due to the nature of the reported defect
- When an owner does not request to carry out a survey

4.4.4 WITHDRAWAL OF CLASS

A classification society may withdraw a vessel from its registry if:

- The owner of a vessel has decided so
- The suspension of the vessel dates more that six months
- A vessel is considered to be a constructive total loss and the owner have no intention on repairing it
- A vessel is reported lost
- An owner declares that the particular vessel will not trade anymore

4.4.5 NOTIFICATION OF SUSPENSION OF CLASS

Once a vessel is suspended or withdrawn by the class, the organization will notify the owner, the underwriters and the flag administration and will publish relevant information on the appropriate databases.

4.4.6 DEFINITIONS OF CLASSIFICATION SURVEYS

PERIOD OF CERTIFICATE OF CLASS

The duration of each class' certificate commences either from the day of the initial classification or from the day of the last special inspection (also called class renewal). The period of the certificate expires at the due date that has been assigned for the next class renewal or special survey.

ANNIVERSARY DATE

The anniversary date is stated in the certificate of class and it is the day and the month which relates to the due date of the certification.

SURVEY TIME WINDOW

The survey time window is the period that a survey can be carried out, offering to the owner time to decide when the vessel will be surveyed.

4.4.7 OVERDUE SURVEYS

Each survey has a predetermined commencement and due date, by which needs to be completed. If the survey has not been carried out by its due date, it becomes overdue.

RECOMMENDATION / CONDITIONS OF CLASS

The class condition and recommendation are the same thing, providing additional time to the owner to rectify a malfunction that is affecting the vessel's class status. Once the malfunction is restored, the vessel may retain its class. In order for the class to give a recommendation / condition, the ship manager must notify the classification society once the damage occurs.

MEMORANDA

Memoranda may be information that surveyors have to take into consideration prior their attendance. Memoranda may include several notes related to materials and other constructional information or can define a condition that deviates the technical standards but have no effect at a vessel's classification status.

4.5. CLASS SURVEYS

4.5.1 CLASS RENEWAL – SPECIAL SURVEY

Class renewal survey is a major survey carried out at five-year intervals. Visual checks, measurements, and inspections of the vessel's hull, as well as the vessel's important auxiliary machinery, are all part of the survey. The main scope of the class renewal survey is to verify that the vessel satisfies the relevant rules of the society.

The class special survey can commence during the 4th annual survey and may finalize on the 5th anniversary date. In exceptional circumstances, the class renewal survey may be extended to a 3-month period after the survey's expiration date. However, in those cases, the future surveys will be initiated from the expiration date prior to vessel's extension due date.

In case that a surveyor finds deficiencies during the vessel's class renewal survey, owners should rectify same prior to the special survey's completion. Minor deficiencies found may be included as conditions of class and should be rectified within a specific time frame, not exceeding the usual 3-months period.

Figure 74: Docking survey (Applied Technical Services, 2021)

The class renewal survey initiates with the inspection of the vessel's hull and deck equipment. These inspections are essential as it is verified that the structural condition of the vessel remains effective. In addition, it helps detect significant corrosion, significant deformation, damage or any other structural wear.

The survey of the hull and deck equipment covers the below (DNV-GL, 2015):

- Thickness measurements of hull structure, depending on each vessel's age
- Anchoring equipment
- Hatch covers and coamings, where applicable
- Air pipes
- Examination of ballast tanks, watertight bulkheads, machinery areas, coating inside tanks of potable water, tanks of low flashpoint liquids
- Mooring and towing equipment
- Ship with movable car decks where applicable
- Ships equipped to carry containers
- Loading computer systems and instruments

The survey of the machinery and systems covers the below:

- Propulsion system
- Steering and manoeuvring systems
- Auxiliary systems
- Boilers and thermal oil heaters
- Auxiliary engines (for electrical power production)
- Systems allowing the vessel to carry special cargoes
- Tanks in the machinery area (lube oil tanks or fuel oil tanks)
- Water ingress systems

4.5.2 ANNUAL SURVEY

Annual survey is a general survey that is conducted within a time frame commencing three months prior and three months after each vessel's anniversary date. During the annual survey, the attending surveyor inspects the hull, the equipment and the machinery of the vessel and performs several tests that will verify the vessel's general condition.

Part of the annual survey includes the review of documentation, operational instruments and markings onboard the vessel. The attending surveyor will verify (DNV-GL, 2015):

- The validity of the certificate of loading computer system (if same is available onboard)
- Approved loading and stability information
- Manual with operational and maintenance guidelines needs to be validated for several items onboard, such as protective coating regarding the ballast tanks containing only sea water, arrangements for the washing of crude oil or system that controls the vapor emissions
- Evidence records, validating that the fire fighting equipment (fire extinguishers) have been inspected by authorized workshops
- Required signboards or notice plates
- Onboard evidence that the vessel's crew is maintaining all machineries according to the planned maintenance schedule properly
- Evaluation and review of the vessel's continuous machinery survey regarding all machinery and of the vessel's planned maintenance schedule for hull and machinery
- For the vessel's complying with SOLAS reg. II-1/3-5, a survey from the class will be conducted in order to validate that all materials used in installations onboard the vessel do not contain asbestos.

The next part of the annual survey includes the inspection of hull and equipment condition. In particular, the attending surveyor will examine:

- All side shell plating above the vessel's waterline and weather decks
- Mooring, anchoring and towing arrangement equipment
- Hatch covers and coamings arrangement, including the closing or opening mechanisms of the systems that are sealing the cargo hold
- All watertight areas, such as watertight bulkheads or watertight doors in the vessel's stern and bow
- Ventilator ducts inside the engine room area and ventilators or air pipes in all decks
- All discharges from the vessel's hull, including valves or scuppers
- Freeing ports and shutters
- Fittings and hull supporting structures, as far as practicable, for stowage, securing and supporting of timber deck cargoes, containers, movable car decks pontoons

- Securing and lashing equipment's condition, especially on open decks
- The condition of all pipes on main deck
- All safety-related items that are concerning the crew's health, such as guardrails gangways or bulwarks
- Areas found with significant corrosion
- Electrical installations' condition in regards to tanks or pipelines
- For operational safety, on vessels with car decks, a thorough examination shall be carried out regarding the accident prevention

The final part of the annual survey is the machinery and systems inspection. In particular the attending surveyor will examine:

- Inspection of spaces
- Boilers visual inspection
- Steam Drums visual inspection
- Visual examination of pressure vessels
- Validation of the operational condition of the fuel injection piping system and the insulation for hot surfaces (above 200 degrees Celsius)
- Incinerators
- Steering gear
- Fire protection systems
- Alarm systems, including alarm testing and fire alarms
- Boiler installations
- Operational testing on all quick closing valves
- Operational testing on bilge systems, their remote operation and alarm systems
- Operational testing regarding the bridge or engine control room communication with other machinery
- Systems allowing the vessel to carry dangerous cargoes
- Control or monitoring systems
- Emergency systems for passenger ships
- Electrical installations

4.5.3 INTERMEDIATE SURVEY

The intermediate survey may be conducted within the vessel's second and third annual survey. This survey's scope is the verification of the vessel's structural condition in accordance with the classification society's requirements. These requirements may differ subject to the vessel's age and type, and if the attending surveyor deems it necessary, further thickness measurements may be requested.

In general, the scope of the intermediate survey for all types of ships may cover (DNV-GL, 2015):

- Ballast tanks inspection
- Cargo compartments inspection

- In case corrosion is found anywhere inside the above areas, extended thickness measurements may be carried out
- Thorough inspection on the lower parts of the ballast and cargo tanks

Any areas that are identified either for their condition or found with corrosion, shall be recorded and be monitored during the future annual surveys. For ships aged between 5 to 10 years, an overall inspection shall be carried out to several representative ballast tanks, selected by the attending surveyor. If the representative tanks are in poor protective coating condition, extended inspection may be carried out to similar tanks.

For ships aged over 10 years, a thorough examination shall be carried out on all ballast tanks. Particularly, piping (such as cargo piping, bilge and ballast piping, air or sounding piping and fuel pipes) shall be inspected extensively.

Additionally, for the bulk carriers the intermediate survey also includes the thorough inspection of the hatch covers and its coamings, their sealing an securing devices. Proper operational test shall be conducted on all the above to validate the required operation of the vessel in accordance with the classification's rules. For oil and chemical tankers, a thorough examination shall be carried out to verify that all cofferdams, void spaces and pipe tunnels are in good condition. Also, testing shall be carried out on all deck's cargo piping, on cargo and ballast piping within the cargo holds area.

Regarding the machinery and systems, the intermediate survey's scope includes the inspection of the electrical installations, the fuel cell installations and the gas fueled engine installations. In addition to the above, an examination shall be carried out in possible gas-dangerous spaces with reference to substantial corrosion, correct rating of lamp, function testing of pressurized equipment and of related alarms and test on all insulation resistance of power circuits.

Especially for oil and chemical tankers, additional inspections are necessary, such as the examination of systems for cargo heating and cooling, heating coils, and tank cleaning apparatus.

4.5.4 BOTTOM / DOCKING SURVEY

The bottom / docking survey is an inspection of a vessel's hull and relevant items. Survey may be conducted afloat or when vessel is in dry-dock. In case that the examination is in progress when the vessel is afloat, then the survey is referred as in-water survey. In case that the examination is in progress when a vessel is in dry-dock, then the survey is referred as docking survey.

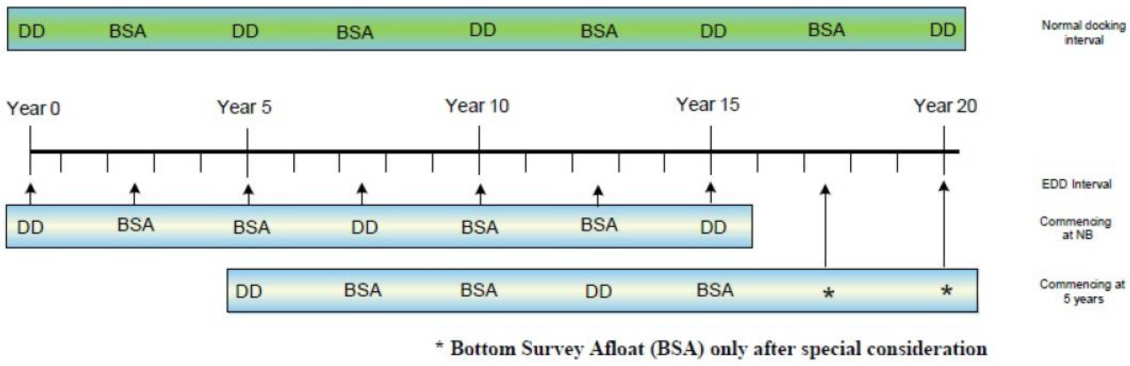


Figure 75: Dry docking scheme (DNV-GL, 2015)

The bottom survey is to be examined twice in a five-year time frame. Once the bottom survey is carried out successfully, then relevant certification of class will be provided by the surveyor, with a validity of 36 months maximum between the surveys. In this particular survey, the outside of the vessel's hull shall be examined thoroughly along with relevant items. The survey includes the examination of the below (DNV-GL, 2015):

- Plating of the vessel's hull and stern frame
- Sea valves, sanitary discharges and scuppers
- Shaft brackets
- Steering fins
- Rudder and rudder bearings
- Thrusters
- Propeller and the propeller's shaft (externally)
- Stabilizer fins

As mentioned before, an owner has the option to carry out the bottom survey afloat, an alternative that can save a significant amount of cost. If the owner decides to carry out the underwater inspection in lieu of drydock (UWILD), then he may apply to the class requesting same.

The classification society's department of ship's safety may request from the owner to provide the below documentation / information (Wingerden, 2016):

- Master's statement, stating the current condition of the hull and in case that a damage has occurred, to describe the location and the damage.

- The site of the survey in which the survey will be carried out. The visibility of the location's waters shall be 2 meters of greater in order for the survey to be carried out. Also, attention may be given to the direction of the current.
- The condition of the hull, which must be clean from any barnacles or other growths in order for the diver and the attending surveyor to have a clear picture of the hull condition

Once the classification society approve the owner's request and after evaluating the vessel's hull findings from the previous dry-docking survey, then the owner shall authorize a diving company to conduct the inspection, approved by vessel's classification society and relevant flag administration. During the survey, the attending class surveyor must be in direct contact with the diver via a closed-circuit television with two-way communication. After the survey's completion, a report should follow, describing all survey's findings and recommendations.

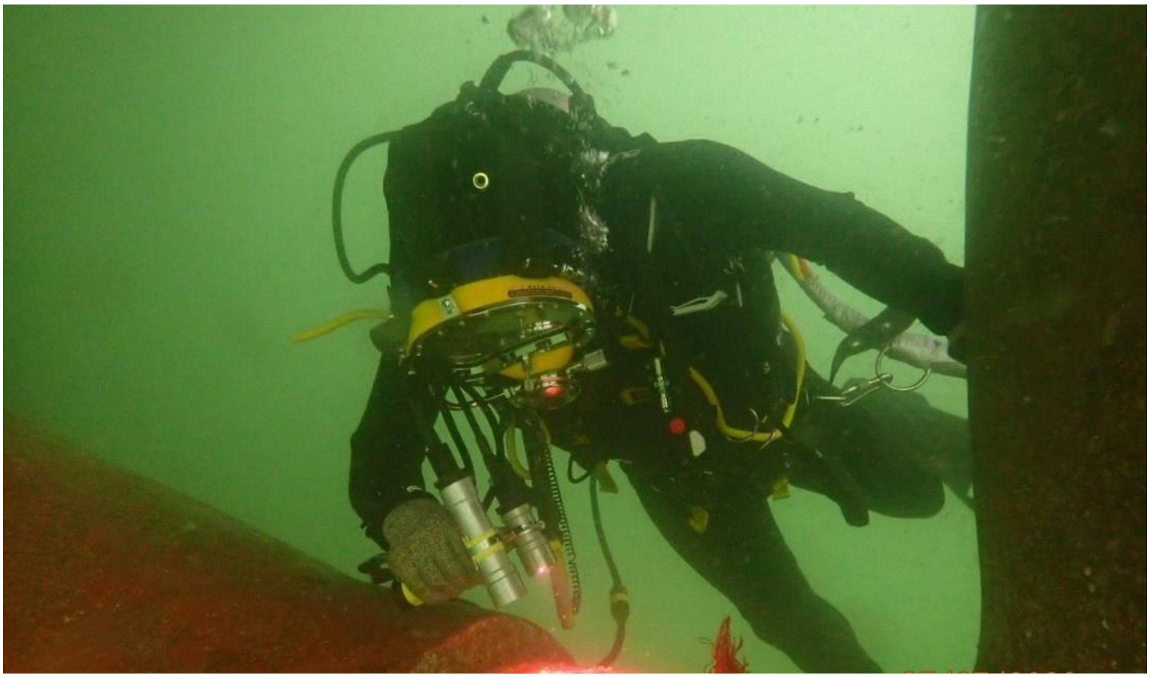


Figure 76: Bottom survey in progress (TTS, 2021)

4.5.5 PROPELLER SHAFT SURVEY

The propeller shaft survey is the thorough examination of the tube shafts and their bearings. The survey may be divided by the below examinations (DNV-GL, 2015):

- Full scope: The propeller shaft is drawn in order to provide access to carry out a thorough examination on the shaft and also on the related systems: shaft bearings, stern bearings and bushes, liners and corrosion inspection, sealing of the shaft including lubrication systems

- Reduced scope: In case the propeller shaft has a type approved sealing gland, the shaft's withdrawal is not necessary, but a thorough examination shall be carried out: new oil seals fitting, verification of the operation of inboard seal, measuring of the aft bearing seals, lubricating oil's level monitoring, historic records of the shaft's aft bearing temperatures, examination of oil sample analysis
- Partial scope for shafts with oil lubrication: the classification may extend by 2.5 years the survey, if the owner may provide the following documentation: measurements on the clearances of the aft bearing, oil consumption and monitoring of the lubricating oil, 6-monthly oil analysis from the system, temperatures from the shaft's aft bearing records, verification that the propeller has no damages

Figure 77: Propeller shaft withdrawal (Diesel Ship, 2017)

4.5.6 BOILER SURVEY

The boiler survey shall be carried out every 2.5 years. In the boiler survey, the following items are examined (DNV-GL, 2015):

- Boilers
- Drums for steam
- Generators for steam
- Steam separators
- Pipelines relevant to the boiler arrangement

Prior to the boiler survey, it is required from the owner to prepare all relevant systems for inspection. The boiler should be cleaned on both gas and water sides, secured from live steam systems, cooled down and well ventilated in order to provide access to the attending surveyor.

Once the systems are prepared for inspection, the classification society's surveyor will survey the following:

- System’s visual inspection
- Inspection of safety valves, level, pressure and temperature transmitters for monitoring and control
- Inspection of relevant reporting regarding the maintenance schedule and system’s operation
- Boiler’s water management system inspection
- Examination of the settings on the system’s safety valves
- Operational testing and functionality inspection regarding the safety valve’s relieving gear

4.6. CLASS CERTIFICATE

4.6.1 ISSUANCE AND VALIDITY OF CLASS CERTIFICATE

The class certificate is issued to declare that ships is inspected for classification and is complying with the Classification Society’s Regulations. It is issued to all classed vessels and includes the expiry date and the class notations assigned to the vessel.

More information such as vessel’s classification number, IMO number, engine specification, port of registry, flag, built location and shipyard’s info are also included in the documentation. The class certificate shall be valid until its expiry date subject to continued compliance with the Society’s Rules and Regulations or in cases that suspension or withdrawal of class are not considered necessary.

The endorsements on the certification are validating that the vessel is being surveyed with periodical surveys (either annual or intermediate) and as per some classification societies practice, indicating that the vessel has several outstanding recommendations / conditions of class.

The classification certificate becomes invalid and the vessel’s classification society is automatically suspended (according to the classification society’s rules and regulations) for the following reasons:

- The owner has not applied and conducted the vessel’s annual inspection within the vessel’s timeframe
- The intermediate inspection has not been carried out within the required timeframe of the third annual survey’s due date, unless vessel’s subject survey is currently in progress

4.6.2 CLASS MAINTENANCE CERTIFICATE

The class maintenance certificate is a certificate that is indicating the condition of the vessel's class status within a specific time frame. The owner may request such certification for the following reasons:

- Sales purposes
- Insurance and claims purposes
- Register purposes
- Oil major purposes
- Newbuilding purposes

With the class maintenance certification, the owner is able to confirm to a potential buyer, a third-party company or in case of an accident, that the vessel is maintained (or was maintained for a specific time period) under the classification society's rules and regulations successfully.

The information that is included on a class maintenance certificate is the following:

- Vessel's IMO number
- Vessel's class number
- Vessel's name
- Vessel's flag
- Vessel's gross tonnage
- Certification that the vessel is maintained for a specific time period (requested by the owner) under the classification society's rules and regulations
- Indication of class conditions (if applicable) during the time period that the certificate was issued for

4.7. STATUTORY CERTIFICATES

4.7.1 AUTHORIZATION AND ISSUANCE

The classification societies may issue statutory certificates on behalf of flag administrations to certify that the regulations of international conventions such as SOLAS, MARPOL, STCW, MLC2006 and codes like ISM and ISPS are being followed.

Specifications and information regarding the statutory certificates may be requested by the flag administrations though. After surveyor's successful inspection, a relevant statutory certification will be issued or endorsed. Most of the certificates have a 5-year validity and after this time period, the certificate shall be renewed.

In case of a minor deficiency in the equipment related to one statutory certificate, the owner should notify the flag administration and the classification society and arrange rectification procedures. The flag administration may issue an authorization letter, instructing the classification society to attend onboard and insect the defective equipment. After the completion of the inspection of the defective equipment, the classification society may issue a conditionally issued statutory certificate, providing an additional rectification period to the owner.

Once the malfunction of the defective equipment is restored, the owner should notify the flag administration and the classification society, arrange a class surveyor for attendance and after the attending surveyor's inspection is complete, the owner shall have the full-term version of the statutory certificate onboard.

The certificates that will be presented are the following:

- International Load Line Certificate
- Cargo Ship Safety Construction Certificate
- Cargo Ship Safety Equipment Certificate
- Cargo Ship Safety Radio Certificate
- International Oil Pollution Prevention Certificate
- International Air Pollution Prevention Certificate
- International Energy Efficiency Certificate
- International Sewage Pollution Prevention Certificate
- International Ballast Water Management Certificate
- International Anti-fouling System Certificate
- Document of Compliance, Special Requirements for Ships Carrying Dangerous Goods
- Polar Ship Certificate
- Inventory of Hazardous Materials Certificate
- International Tonnage Certificate
- Register of Lifting Appliances
- International Safety Management Certificate (ISM Code)
- International Ship Security Certificate (ISPS Code)
- Maritime Labour Certificate

4.7.2 INTERNATIONAL LOAD LINE CERTIFICATE

The international load line certificate is a statutory certificate which is applicable for all vessels with more than 24 meters length and more than 150 gross tonnes. The validity of the international load line certificate is 5 years. The only case that a load line certificate may be extended is when a vessel is not in port and en route to its destination, and the extension shall not exceed the 3 months period.

The initial survey of this certificate was carried out prior to the vessel’s service commencement. The annual survey shall be carried out 3 months prior and 3 months after the anniversary date, in order to ensure that not any alternations have been made and that the information indicated on the certificate is correct. Its scope is the definition of the maximum allowed draft of the vessel and it’s markings on the vessel’s side shell (DNV, 2021).

As per the International Convention on Load Lines, 1966, Article 14 (International Convention of Load Lines, 2005):

- Prior to the vessel’s commissioning, a survey shall be conducted in order to validate if the vessel’s hull and systems are complying with the Convention’s regulations.
- A survey shall be conducted once the vessel is within the timeframe given by the classification society for a periodical examination. The scope of the survey remains the same of with the survey prior to vessel’s commissioning, to ensure that the vessel still complies with the Convention’s regulations. Also, the survey’s scope includes the verification that no alternations or modifications have been made, and in case of any changes on vessel’s hull or superstructure occurred, those are not affecting the load line position.
- All surveys conducted under the Convention’s regulations shall be included in the vessel’s load line certificate as endorsements.

In Article 15, the Convention states that no modifications shall be made to the vessel’s hull after the completion of the above article 14 surveys, without notifying first the vessel’s flag administration.

In Article 16, the Convention states that the load line certification any be issued either by the vessel’s flag or by a third-party instructed by same (such as a classification society).

On an international load line certificate, the vessel’s freeboard from deck line and its load line is mentioned. In addition, the certificate indicates the vessel’s allowance for every freeboard, except timber, as well as the limits of the deck line from which these freeboards are measured. Also, its plimsoll line is described.

4.7.3 CARGO SHIP SAFETY CONSTRUCTION CERTIFICATE

The cargo ship safety construction certificate is required for merchant vessels with 500 gross tonnes and more for international voyages (NAVREGS, 2016). The certification is a requirement described under the SOLAS chapters II-1, II-2, III, IV and V and chapter I, Part B: Surveys and certificates, regulation 10 (IMO, 2020). Regulation 10 of the SOLAS Convention refers to surveys that the vessel shall be subjected in order to acquire the safety construction certificate. The survey covers the examination of the vessel's structural condition and relevant equipment:

- Prior to the vessel's commissioning, an initial inspection shall be conducted to vessel's bottom area. Further to the vessel's bottom area, inspection shall include also the examination of the vessel's structure and machinery. In the examination process, surveyor will validate that the vessel's outfitting, steam production equipment and power production equipment are following the Convention's regulations. In case that the vessel is a tanker, additional examination shall be conducted regarding the condition of vessel's pumproom and piping arrangements.
- Certificate's renewal shall be issued on a 5-yearly period. Renewal survey's scope is to verify that all relevant equipment's and hull's items are complying with the regulations instructed by the Convention.
- An intermediate examination between vessel's second and third annual surveys shall be carried out to validate that the regulations of the Convention are being followed. The intermediate inspection includes the examination of vessel's machinery, electrical connections, steam production and maneuvering systems. In case that the vessel is a tanker, the survey also covers the examination of pumprooms and several piping arrangements.
- An annual inspection shall be carried out 90 days prior and 90 days after the vessel's anniversary date. The scope of the survey is an overall examination on the vessel's systems, verifying that the condition of each system is maintained properly as per Convention's suggestions.
- The Convention states that two inspections shall be carried out on the vessel's external bottom area at minimum.

4.7.4 CARGO SHIP SAFETY EQUIPMENT CERTIFICATE

The cargo ship safety equipment certificate is a document that covers the following:

- Firefighting equipment
- Lifesaving appliances
- Navigational equipment
- Sound and distress signals

The cargo ship safety equipment certificate is required for cargo ships with 500 gross tonnes and more for international voyages (NAVREGS, 2016). The certification is a requirement described under the SOLAS, Part B: Surveys and certificates, regulation 8 (IMO, 2020):

- An initial examination shall be conducted prior to the ship's commissioning, related to the vessel's life saving appliances, fire fighting and navigational equipment. The Ship Safety Equipment Certificate does not include the radio equipment as same is covered in other certification. The survey covers the examination of the vessel's fire fighting system and of the vessel's means of signals.
- A renewal examination for a 5-yearly time period. The scope of the survey is to validate that all systems covered under the Ship Safety Equipment Certificate ae complying with the Convention's regulations.
- An annual inspection shall be carried out 90 days prior and 90 days after the vessel's anniversary date. The scope of the survey is an overall examination on the vessel's systems, verifying that the condition of each system is maintained properly as per Convention's suggestions.

An owner must appoint workshops approved by the vessel's classification society and its flag administration in order to proceed with the inspections. During the LSA survey the items covered are the following:

- Lifeboats
- Davits and winches
- Rescue boats
- Liferafts

The appointed workshop which is approved by the flag authority and the classification society issues a certificate validating that the condition of all the above in in good order and that the vessel may sail with subject equipment onboard. There are two kinds of LSA surveys: the annual and the 5-year. In the 5-year LSA survey the items for annual inspection are included and additionally the workshop performs lifeboat davits load tests.

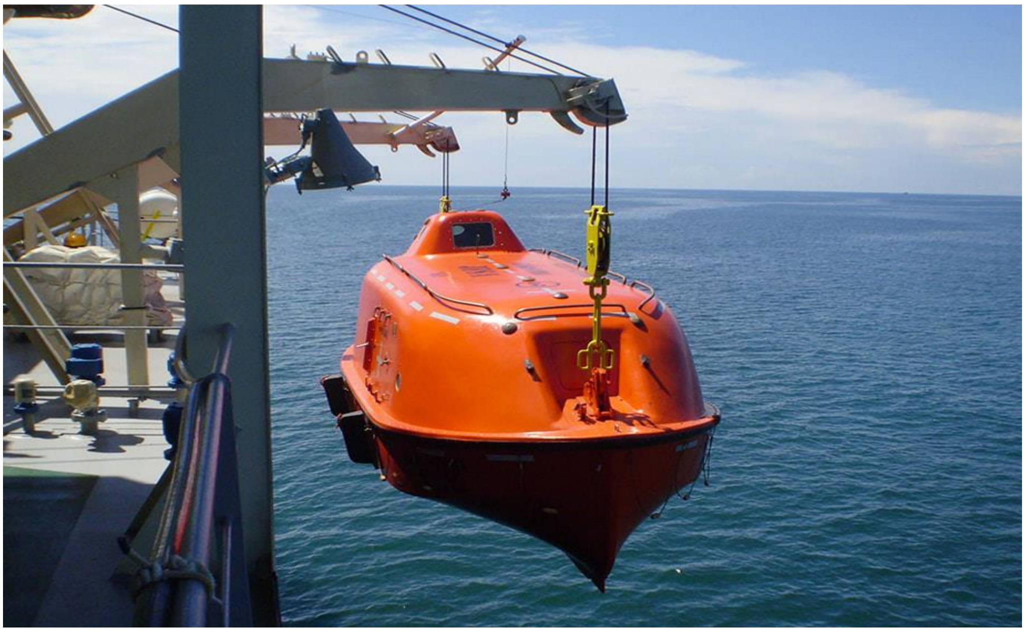


Figure 78: Lifeboat davit load test (Bureau Veritas, 2021)

For the fire fighting equipment, which is included in the Cargo Ship Safety Equipment Certificate, the workshop which will perform the annual or the 5-year survey must also be approved by the vessel's classification society and flag administration. The items covered in the fire fighting equipment survey are the following:

- Fire extinguishers
- Foam applicator
- Water mist
- Foam fixed system inside the engine room
- Foam analysis of fixed foam system
- Breathing apparatus
- Breathing apparatus compressor air quality test
- Fireman's outfit
- Medical oxygen
- Emergency escape breathing devices (EEBD's)
- Immersion suits
- Lifejackets

The 5-year survey includes all annual survey's items and additionally the hydrotesting of several fire fighting equipment system's such as breathing apparatus cylinders and the thorough service of the water mist system.

Figure 79: Fire extinguishers survey (Triton Group, 2021)

4.7.5 CARGO SHIP SAFETY RADIO CERTIFICATE

The Cargo Ship Safety Radio Certificate is indicating the vessel's radio equipment is being surveyed under the International Convention for The Safety Of Life At Sea (SOLAS) Chapter I regulation 9 requirements, detailed also in the SOLAS Chapter IV. The certification is a requirement for all vessels with 300 gross tonnes and above. For the certification of Cargo Ship Safety Radio Certificate, the below surveys should be conducted:

- An initial examination prior to the vessel's commissioning shall be carried out. The scope of the survey includes the verification that all radio equipment onboard the vessel (including radio equipment on the life saving appliances) is in compliance with the Convention's regulations.
- Certificate's renewal shall be issued on a 5-yearly period. Renewal survey's scope is to verify that all radio equipment onboard the vessel (including radio equipment on the life saving appliances) is in compliance with the Convention's regulations.
- An annual examination within 90 days before and 90 days after of the anniversary date of subject certification. The scope of the examination includes the verification that all radio equipment onboard the vessel (including radio equipment on the life saving appliances) is in compliance with the Convention's regulations.

Along with the Cargo Ship Safety Radio Certificate, a Record of Equipment for Cargo Ship Safety Radio (Form R) is provided. The Form R record contains information that the below listed equipment is surveyed:

1 Primary systems

1.1 VHF radio installation:

1.1.1 DSC encoder

1.1.2 DSC watch receiver

1.1.3 Radiotelephony

1.2 MF radio installation:

1.2.1 DSC encoder

1.2.2 DSC watch receiver

1.2.3 Radiotelephony

1.3 MF/HF radio installation:

1.3.1 DSC encoder

1.3.2 DSC watch receiver

1.3.3 Radiotelephony

1.3.4 Direct-printing telegraphy

1.4 Recognized mobile satellite service ship earth station

2 Secondary means of alerting

3 Facilities for reception of maritime safety information

3.1 NAVTEX receiver

3.2 EGC receiver

3.3 HF direct-printing radiotelegraph receiver

4 Satellite EPIRB

4.1 COSPAS-SARSAT

5. VHF EPIRB

6 Ship's search and rescue locating device

6.1 Radar search and rescue transponder (SART)

6.2 AIS search and rescue transmitter (AIS-SART)

Figure 80: Record of Equipment for Cargo Ship Safety Radio (Form R) list (ClassNK, 2021)

Also, the record indicates the methods used to ensure availability of radio facilities as per regulations IV/15.6 and 15.7, given below (IMO, 2020):

"***SOLAS, Regulation IV 15.6** – on ships engaged on voyages in sea areas A1 and A2, the availability shall be ensured by using such methods as duplication of equipment, shore-based maintenance or at-sea electronic maintenance capability, of a combination of these, as may be approved by the administration."*

***"SOLAS, Regulation IV 15.7** – on ships engaged on voyages in sea areas A3 and A4, the availability shall be ensured by using a combination of at least two methods such as duplication of equipment, shore-based maintenance or at-sea electronic maintenance capability, as may be approved by the administration, taking into account the recommendation of the organization."*

Figure 81: Service and test of radio equipment: EPIRBs and GMDSS (Aeromarine SRT, 2021)

4.7.6 INTERNATIONAL OIL POLLUTION PREVENTION CERTIFICATE

The international oil pollution prevention certificate is issued under the International convention for the prevention of pollution from ships (1973). The certification verifies that:

- The vessel is examined following the regulations of Annex I of the Convention and
- The vessel's structure, equipment, fittings, systems, arrangement and materials all found in satisfactory condition and the vessel complies with Annex I requirements

Annex I- Regulations for the Prevention of Pollution by Oil is given below (MARPOL, 2021):

According to the regulation 6 of the Convention, all vessels with 400 gross tonnage and above and all tankers with 150 gross tonnage and above shall be subjected to the below surveys:

- Prior to the vessel's commissioning, an initial inspection shall be conducted to vessel's equipment and structure. In the examination process, surveyor will validate that the vessel's equipment and structure are following the Convention's regulations.
- Certificate's renewal shall be issued on a 5-yearly period. Renewal survey's scope is to verify that all relevant equipment is complying with the regulations instructed by the Convention.

- An intermediate examination between vessel's second and third annual surveys shall be carried out to validate that the regulations of the Convention's Annex are being followed. The intermediate inspection includes the examination of vessel's pumping and piping arrangements as well as the oil discharging systems and the oil water separator arrangement.
- An annual inspection shall be carried out 90 days prior and 90 days after the vessel's anniversary date. The scope of the survey is an overall examination on the vessel's systems, verifying that the condition of each system is maintained properly as per the Annexes' suggestions.

According to the regulation 7 of the Convention, after the completion of initial and renewal examinations, an International Oil Pollution Prevention certificate shall be issued accordingly. The regulation refers to the vessels with a gross tonnage of 400 tonnes or above and/or tankers with a gross tonnage of 150 tonnes and above, calling the ports under the jurisdiction of the flag administrations which are complying with the Convention. Also, the Convention states that the certification shall be issued either by the vessel's flag administration or by an organization instructed by same.

In addition to the International Oil Pollution Prevention Certificate (IOPP certificate), Annex I requires the issuance of a supplement document called Record of Construction and Equipment for Ships Other Than Oil Tankers. This record, together with the initial IOPP certification, must be retained onboard at all times. The following details are included in the file:

- Ship's particulars
- Equipment of oil discharge control from bilges and fuel oil tanks inside machinery areas
- Means of sludge disposal (as per regulation 12)
- Discharge connection methods (as per regulation 13)
- Emergency plan for marine pollution (as per regulation 37)

4.7.7 INTERNATIONAL AIR POLLUTION PREVENTION CERTIFICATE

The International Air Pollution Prevention Certificate is a documentation ensuring that every vessel with 400 gross tonnes and above is in accordance to MARPOL's Annex VI – Regulations for the Prevention of Air Pollution from Ships (MARPOL training, 2017).

Any intentional releases of ozone-depleting chemicals are forbidden. Except for minor releases linked with the recapture or recycling of an ozone-depleting material, purposeful emissions include those emissions that are been generated once a system is repaired or maintained. Parties to the 1997 Protocol may restrict emissions resulting from ozone-depleting substance leaks, whether the leaks are deliberate.

The International Air Pollution Prevention Certificate also applies for Nitrogen oxides (NOx), regarding vessel's engines that were installed from 1st of January 2000 and after. From the certificate's scope the following engines are excluded:

- Emergency diesel engines
- Engines installed on the vessel's lifeboats
- Engines subject to an alternative nitrogen oxides control measure approved by the flag Administration, engines placed on ships that are trading in routes under the authority of the vessel's flag administration
- Every other equipment that will be used only in case of emergency

The regulation and therefore the certification prohibits the operation of any diesel engines, except those which are within some limits, set out by the convention in accordance with the Nitrogen oxides (NOx) Technical Code. Also, for engines consuming hydrocarbon blends derived from petroleum refining, testing and measurement procedures shall comply with relevant NOx Technical Code.

The diesel engine's operation is allowed either by:

- A system cleaning the exhaust gases is installed on the vessel, as long as subject system is approved by the flag administration and in accordance with the Nox Technical Code, reducing NOx emissions to the specified limits or;
- An equivalent method, approved by the flag administration, which reduces the Nox emissions to the desired limits

In addition to the ozone -depleting chemicals and the nitrogen oxides (NOx), the regulation sets a maximum limit to the sulphur oxides (Sox) too. Particularly, any fuel oil used onboard each vessel should not exceed the cap of 4.5% m/m. The Organization will monitor the global average sulphur content of residual fuel oil supplied for use on board ships, based on rules that will be set, so the current sulphur oxides' cap is subject to change.

As per MARPOL Annex VI, Chapter 3, vessels sailing to the North American Sea, the United States Caribbean Sea, the Baltic Sea and the North Sea shall use fuel oil with sulphur content not exceeding the can of 1.5% m/m (IMO, 2014).

In addition to the above requirement, MARPOL sets another restriction in Chapter 3, Regulation 14(4)(b):

"an exhaust gas cleaning system, approved by the Administration taking into account guidelines to be developed by the Organization, is applied to reduce the total emission of sulphur oxides from ships, including both auxiliary and main propulsion engines, to 6.0 g SOx/kW·h or less calculated as the total weight of sulphur dioxide emission. Waste streams from the use of such equipment shall not be discharged into enclosed ports, harbours and estuaries unless it can be thoroughly documented by the ship that such waste streams have no adverse impact on the ecosystems of such enclosed ports, harbours and estuaries, based upon criteria communicated by the authorities of the port State to the Organization. The Organization shall circulate the criteria to all Parties to the Convention" (MARPOL training, 2017)

The certificate will be required prior to the vessel's first voyage. This inspection must validate that all systems meet the applicable standards of this Annex. To ensure that the vessel's equipment is in compliance with the applicable regulations of this Annex, a 5-yearly renewal examination shall be conducted, under the flag Administration's instructions. In case of a malfunction on a system relevant to the certificate, the survey must ensure that all required rectifications or new installations have been effectively restored, with materials found to be satisfactory, and that the vessel is complying once again with the requirements of this Annex in all respects.

In addition to the International Air Pollution Prevention Certificate, a supplement certificate is also issued, indicating the specifications of each vessel's engines regarding the requirements of the nitrogen oxides (NOx). The supplement also validates that vessel complies with the sulphur oxides' (SOx) requirements, indicating the fuel oil sulphur content used by the vessel.

4.7.8 INTERNATIONAL ENERGY EFFICIENCY CERTIFICATE

The International Energy Efficiency Certificate (IEEC) is a requirement after the adoption of resolution MEPC.203(62) which includes regulations for energy efficiency for ships in MARPOL Annex VI. Those regulations came into effect on 1/1/2013 and are applicable to all vessels with 400 gross tonnes and above.

The International Energy Efficiency Certificate (IEEC) is issued for both newbuilding and vessels already in service. In the first occasion, the certification is issued during the initial survey while for the second case this statutory certificate is issued during either vessel's intermediate or renewal survey. The certificate is issued once for every vessel (Human Environment and Trasport Inspectorate (Ministry of Infrastructure and Water Management), 2021).

For the issuance of the International Energy Efficiency Certificate (IEEC), the attending classification society's surveyor will validate that the vessel is in compliance with the below regulations, as stated in the Annex VI of the International Convention for the Prevention of Pollution from ships:

- Regulation 20: Attained Energy Efficiency Design Index (EEDI), an index showing the energy efficiency calculation results for a particular vessel
- Regulation 21: Required Energy Efficiency Design Index (EEDI), an index showing the energy efficiency for the particular vessel's type allowance limit
- Regulation 22: Ship Energy Efficiency Management Plan (SEEMP), a plan designed from the ship owners, which aims to measure and improve the vessel's energy efficiency in operation

4.7.9 INTERNATIONAL SEWAGE POLLUTION PREVENTION CERTIFICATE

The Annex IV of MARPOL sets several regulations to the vessels' sewage discharge into the sea. With those regulations the health hazard from the discharging of raw sewage can be eliminated.
Also, with this limitation the oxygen depletion that can create visual pollution on coastal areas can be terminated, giving a solution to the cities which are based in the tourist industries.

Annex IV comprises several rules governing the discharging of sewage in the waters by vessels, containing rules governing the vessel's machinery and arrangements for sewage discharging control, the provision of sewage port reception facilities, and survey and certification requirements (IMO, 2021). The oceans are thought to be capable of digesting and dealing with untreated sewage on the high seas through natural bacterial action. As a result, unless otherwise indicated, the provisions in Annex IV of MARPOL forbids the sewage discharging in the waters between a defined mileage form the shore. Thus, the governments of the countries with ports must provide to each vessel the facilities for the reception of the sewage, facilities capable enough not to cause any delay to their operation schedule.

The updated Annex applies to vessels with 400 gross tonnes or above, certified in carrying more than 15 people on international voyages. Vessels must have an approved by the flag administration and the classification society sewage treatment plant, an approved sewage and disinfection system, or a sewage holding tank, according to the Annex.

Discharging sewage into the sea is forbidden unless the ship is operating an approved sewage treatment plant or is discharging and disinfected sewage using an approved method more than three nautical miles from the nearest land. When the vessel is underway, travelling with more than 4 knots, untreated sewage can be released 12 nautical miles and above of the closest land and the discharging rate should be instructed by the Administration (as per MEPC.157(55)).

The International Sewage Pollution Prevention Certificate (ISPP) is ensuring that the sewage treatment system is operating in good working order. Also, on the certificate the sewage treatment plant type and name of manufacturer is mentioned, along with the vessel's particulars. The surveys required for the certificate's issuance are the below:

- Initial examination prior to the issuance of the International Sewage Pollution Prevention Certificate or prior to the ship's operation commencement
- Renewal survey in case the certificate is issued, not exceeding the 5-year time period.

4.7.10 INTERNATIONAL BALLAST WATER MANAGEMENT CERTIFICATE

Invasive aquatic organisms pose a significant hazard to marine ecosystems, and shipping has been identified as a primary route for bringing species to new areas. The problem worsened as commerce and traffic volumes increased over the last few decades, especially with the development of steel hulls, which allowed ships to use water as ballast instead of solid items. The consequences of introducing new species have been severe in many parts of the planet. The rate of bio-invasions is continuing to rise at an alarming rate, according to quantitative statistics. The situation may not have reached its apex yet, since the volume of seaborne trade continues to grow (IMO, 2021).

In 2004, the Ballast Water Management Conversion adopted and has set out management, control guidelines and procedures for the vessels' ballasting arrangements, so as to achieve the prevention of harmful aquatic organisms spreading to foreign marine environments.

According to the convention, all vessels operating in an international trade are obliged to have the below documentation on board (ClassNK, 2021):

- Management plan for ballast water and sediments (BMWP)
- Ballast water record book (BWRB)
- International ballast water management certificate (IBWMC)

The Ballast Water Management Convention (BWM, 2004) suggests in section D two methods for the proper management of the ballast water:

“Regulation D-1 Ballast Water Exchange Standard - Ships performing Ballast Water exchange shall do so with an efficiency of 95 per cent volumetric exchange of Ballast Water. For ships exchanging ballast water by the pumping-through method, pumping through three times the volume of each ballast water tank shall be considered to meet the standard described. Pumping through less than three times the volume may be accepted provided the ship can demonstrate that at least 95 percent volumetric exchange is met.

Regulation D-2 Ballast Water Performance Standard - Ships conducting ballast water management shall discharge less than 10 viable organisms per cubic metre greater than or equal to 50 micrometres in minimum dimension and less than 10 viable organisms per millilitre less than 50 micrometres in minimum dimension and greater than or equal to 10 micrometres in minimum dimension; and discharge of the indicator microbes shall not exceed the specified concentrations.” (IMO, 2021)

In order for the requirement of the regulation D-2 to be achieved, a ballast water treatment system is required to be installed onboard. The ballast water treatment system shall be approved by the flag administration and the classification society in order to be installed onboard. Prior to the initial ballast water management certificate survey, the owner of the vessel shall provide to the classification society relevant drawings, indicating the pipeline and electronic cablings arrangements of the ballast water treatment system, subject to classification society’s approval. Once the approval is granted, then the classification society’s surveyor shall attend the vessel, inspect the ballast water treatment system’s operation (along with the witnessing of the ballast water treatment system’s maker’s representative) and validate that all relevant documentation is kept onboard. Once all parameters are successfully validated, the classification society’s surveyor shall issue the initial international ballast water management certificate (IBWMC), subject to approval to the flag administration. The flag administration will then issue a full-term international ballast water management certificate, which includes the below information:

- Vessel’s particulars
- Vessel’s principal ballast water management methods (D-1 and in case D-2 is applied, then the type and model of the ballast water treatment system is indicated)
- Validity of the certification (subject to surveys in accordance with regulation E-1 of the Annex to the Convention)

According to the Annex-Section E of the Convention, the international ballast water management certificate consists of the initial renewal survey and an annual, an intermediate and a renewal survey. Related appendices will be included to the full-term international ballast water management certificate, issued by the flag administration.

4.7.11 INTERNATIONAL ANTI-FOULING SYSTEM CERTIFICATE

Lime and subsequently arsenic were used to coat the hulls of sailing ships until the contemporary chemical industry produced efficient anti-fouling paints based on metallic compounds. Barnacles and other marine creatures that have latched themselves to the ship slowly "leach" into the sea water, destroying them. However, investigations have revealed that these substances persist in the water, killing sea life, causing environmental damage, and possibly entering the food chain. The organotin tributyltin (TBT), which has been demonstrated to cause deformations in oysters and sex changes in whelks, is found in one of the most efficient anti-fouling paints produced in the 1960s. (IMO, 2021)

According to the terms of the International Convention on the Control of Harmful Anti-Fouling Systems on Ships (2001), the use of harmful organotin in anti-fouling paints which the vessels use for coating to prevent the attaching of various sea organisms (algae, molluscs) resulting to the reduction of the vessel’s speed in voyage and therefore the increase of the fuel consumption, is prohibited.

The vessels flying the flag or operate under the authority of a party or entering a shipyard or a port of this party of the Anti-Fouling System (AFS) Convention, is not allowed to use such harmful anti-fouling systems. Those systems are included in the Convention’s Annex, which is being updated on regular basis.

The scope of the International Anti-Fouling System Certificate is to certify that the vessel's anti-fouling system is complying with relevant rules and regulations of the International Convention on the Control of Harmful Anti-Fouling Systems on Ships (2001). The certificate is issued by the classification society and a survey shall be carried out each time the vessel changes or replaces its anti-fouling system. In case of minor repairs on vessel's hull have been occurred, a survey is not considered necessary. However, in case that the repairs are affecting an area of 25 percent of the anti-fouling system's area, a survey shall be carried out and if necessary, a new anti-fouling certificate shall be renewed. Once a survey is requested by the owner of the vessel, apart from the vessel's specification, further information for the anti-fouling system is required, provided either by the owner or the anti-fouling system manufacturer. The below information shall be given to the classification society (IMO, 2010):

- Anti-fouling system's type
- Manufacturer's name
- Systems type and colour
- Active ingredients and their CAS numbers (Chemical Abstract Service Registry Number)

4.7.12 DOCUMENT OF COMPLIANCE, SPECIAL REQUIREMENTS FOR SHIPS CARRYING DANGEROUS GOODS CERTIFICATE

According to the International Convention for the Safety of Life at Sea (1974) Chapter II – Regulation 19, a vessel may carry goods considered dangerous if the below conditions are being followed (IMO, 2020):

- Additional fire fighting equipment must be supplied onboard the vessel, both for the vessel's crew (personnel protective equipment) and installed systems, in order for the vessel to be protected in case there is a hazard during the loading and carriage of those goods
- The cargo holds and relevant cargo must be protected and at distance from items that can cause fire ignition
- Sufficient water supply both in proper quantity and pressure, required in case of a fire outbreak
- Proper drainage systems both for the water that will extinguish the potential fire or for toxic cargo fluids
- Fire detecting systems installation inside the cargo spaces
- Arrangements for the air renewal inside the cargo space, provided by a ventilation system (such as electrical fan)
- Proper insulation installations between the areas of machinery and cargo holds

Further to the above listed requirements, the vessel must comply also to the International Maritime Dangerous Goods (IMDG) Code and the International Maritime Solid Bulk Cargoes (IMSBC) Code to be credited with certification of the carriage of such goods.

Once a commencement inspection is complete, the certification is endorsed on an annual basis, and a renewal examination shall be conducted 5 years after the initial certification issuance.

The dangerous goods are classified under the following categories:

Class 1	–	Explosives
Class 2	–	Gases : compressed, liquefied or dissolved under pressure
Class 3	–	Flammable* liquids
Class 4.1	–	Flammable* solids
Class 4.2	–	Substances liable to spontaneous combustion
Class 4.3	–	Substances which, in contact with water, emit flammable gases
Class 5.1	–	Oxidizing substances
Class 5.2	–	Organic peroxides
Class 6.1	–	Toxic substances
Class 6.2	–	Infectious substances
Class 7	–	Radioactive materials
Class 8	–	Corrosive substances
Class 9	–	Miscellaneous dangerous substances and articles, i.e. any other substances which experience has shown, or may show, to be of such a dangerous character that the provisions of this part shall apply to it.

Figure 82: Dangerous goods classes list (ClassNK, 2022)

In addition to the dangerous goods classes, a vessel's Document of Compliance – Special Requirements for Ships Carrying Dangerous Goods Certificate indicates a list with dangerous cargoes that the vessel can carry. This list also includes the following information (ClassNK, 2022):

- Each cargo class
- United Nations (UN) number, a four-digit number that indicates the hazardous chemical code
- The cargo holds numbers that can be loaded with the specific dangerous cargo
- Notes, if applicable, for each dangerous cargo

4.7.13 POLAR SHIP CERTIFICATE

IMO's International Code for Ship's Operating in Polar Waters (Polar Code) came into effect on January 1st, 2017, implemented by both the International Convention for the

Prevention of Pollution from Ships (MARPOL) and the International Convention for the Safety of Life at Sea (SOLAS) (IMO, 2017) The Polar Code applies to the vessels on domestic or international voyages trading in Arctic Area or Antarctic Area which according to the code are considered Polar Waters (DNV-GL, 2017).

The implementation dates for Polar Code are the below:

- Part 1 is referring to the safety and training requirements for vessels operating in Polar Areas in accordance with the SOLAS convention
- Part 2 is referring to the protection of the environment of Polar Areas in accordance with the MARPOL convention

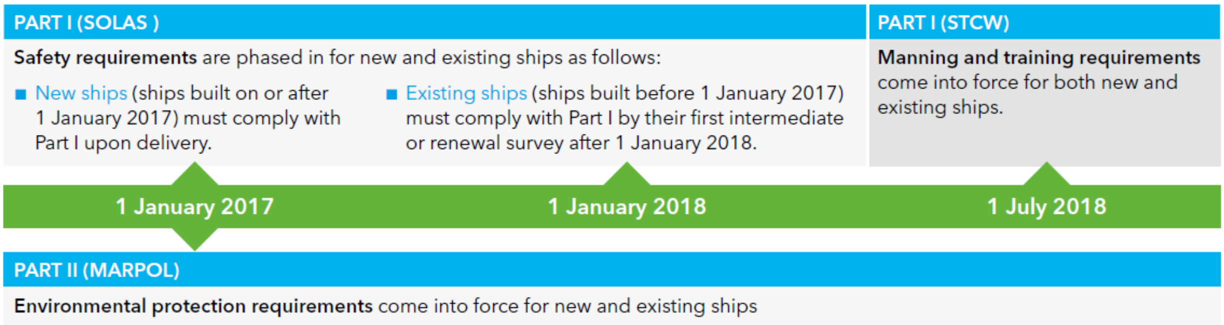


Figure 83: Implementation dates for the Pola Code (DNV-GL, 2017)

In order for the vessel to operate in Polar Areas, the vessel's owner or manager shall take several actions to ensure that the vessel's documentation is complying with the Polar Code. Those actions are listed below:

<u>Part 1 SOLAS</u>

- Polar Ship Certificate shall be available onboard
- Polar water operation manual shall be developed and be available onboard
- Reference to the STCW and Polar Code no.12, vessel should have available onboard the appropriate training certificate issued by the vessel's relevant flag administration
- Reference to the Polar Code no.11, vessel shall initiate voyage planning prior to the vessel's voyage, as instructed by the polar water operational manual (PWOM)

<u>Part 2 MARPOL</u>

- The vessel should have available onboard relevant pollution prevention documentation, updated by the operational requirements for polar areas, including also instructions implemented by MARPOL convention's chapters I, II, IV and V.

The vessels certified by SOLAS convention and operating in polar waters, should carry relevant Polar Ship Certificate. This certification is issued by the flag state or an authorized classification society. The surveyor who will contact the inspection, may validate that the vessel is operating and complying with Part 1 SOLAS convention requirements. Additionally, the owner shall provide to the attending surveyor the below documentation and information:

- Risk assessment (RA) for the operation of the vessel in polar waters

- Polar Water Operational Manual (PWOM) produced for the vessel's particulars and specifications

The surveyor who will attend the vessel in order to issue the Polar Ship Certificate, will inspect the following (DNV-GL, 2017):

i. The vessel complies to the requirements of safety related provisions of the International Code for Ships Operating in Polar Waters
ii. The vessel complies with the requirements of Polar Code related to its structure, radio station arrangements, fittings, equipment and materials
iii. The polar ship category:
    a. Category A – This category includes the vessels which are built in accordance with the IACS Polar ice classes PC1 to PC5 (depending on the operating capability of operation in polar waters and the ice's condition, which at least contains old ice inclusions)
    b. Category B – This category includes the vessels which are built in accordance with the IACS Polar ice classes PC6 and PC7 and are not included in Category A. This category is referring to vessels operating in at least thin ice conditions
    c. Category C - This category includes the vessels which are designed to operate in mild ice conditions and in open water, not listed in categories A and B
iv. Operational limitations, if applicable, indicating the restrictions of the vessel's operation in polar waters

The Polar Ship Certificate will be accompanied with the Record of Equipment (Form PS), which should be complying with the International Code for Ships Operating in Polar Waters. The record of equipment includes:

2.1 Life-saving appliances

1	Total number of immersion suits with insulation
1.1	for crew
1.2	for passengers
2	Total number of thermal protective aids
3	Personal and Group Survival Equipment
3.1	Personal survival equipment – for number of persons
3.2	Group survival equipment – for number persons
3.3	Total capacity of liferafts in compliance with chapter 8 of the Polar Code
3.4	Total capacity of lifeboats in compliance with chapter 8 of the Polar Code

2.2 Navigation equipment

1	Two independent echo-sounding devices or a device with two separate independent transducers
2	Remotely rotatable, narrow-beam search lights controllable from the bridge or other means to visually detect ice
3	Manually initiated flashing red light visible from astern (for ships involved in icebreaking operations)
4	Two or more non-magnetic independent means to determine and display heading
5	GNSS compass or equivalent (for ships proceeding to latitudes over 80 degrees)

2.3 Communication equipment

1	Sound signaling system mounted to face astern to indicate escort and emergency manoeuvres to following ships as described in the International Code of Signals (for ships intended to provide ice breaking escort)
2	Voice and/or data communications with relevant rescue coordination centres
3	Equipment for voice communications with aircraft on 121.5 and 123.1 MHz
4	Two-way voice and data communication with a Telemedical Assistance Service (TMAS)
5	All rescue boats and lifeboats, whenever released for evacuation, have a device (for ships certified to operate in low air temperature)
5.1	for transmitting vessel to shore alerts
5.2	for transmitting signals for location
5.3	for transmitting and receiving on-scene communications
6	All other survival craft have a device
6.1	for transmitting signals for location
6.2	for transmitting and receiving on-scene communications

Figure 84: Record of equipment for the Polar Ship Ceritifcate (From PS) list (ClassNK, 2021)

4.7.14 INVENTORY OF HAZARDOUS MATERIALS CERTIFICATE

Several years ago, it has been noticed that during the vessels' recycling procedures, several health and environmental hazards were generated, causing concerns about the effects of the recycled materials both in the environment but also to human health.

Due to this fact, in 2009, the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships came into effect (IMO, 2022), providing regulations for safe materials' use onboard the vessels, from their beginning of their construction to their recycling. In this respect, the recycling effects both on environment and human life are within safe levels.

The Inventory of Hazardous Materials (IHM) contains a list with the quantity and number of hazardous materials located onboard the vessels that are either in vessel's construction, on wastes during vessel's operation or in vessel's stores.

According to the European Union's Ship Recycling Regulation (EU SRR) (European Parliament, 2013), all newbuilding vessels carrying a European member's flag should be commissioned with an issued Inventory of Hazardous Materials list and certificate accordingly. Also, all vessels heading to recycling, should carry a valid Inventory of Hazardous Materials certificate and should be recycled on recycling yard which is authorized by the European Union's regulations. Finally, as per European Union's Ship Recycling Regulation (EU SRR), after 31 December 2020, all vessels carrying a European member's flag or any vessels under a non-European member's flag, calling any of the European Union's port, should hold a validated Inventory of Hazardous Materials (IHM) certification.

In order for the Inventory of Hazardous Materials (IHM) list to be prepared, the following process need to be followed:

- For newbuilding vessels, the party who must prepare and issue relevant certification is the exclusive shipyard, where the vessel is being constructed
- For vessels already in service, the party responsible who must prepare, and issue relevant certification is the owner, who need to proceed with the following:
  - Gather and evaluate status of the materials onboard
  - To arrange attendance of Hazmat experts, approved by the vessel's flag administration and classification society, in order for the sampling process to be commenced
  - The Hazmat experts shall dispatch relevant samples for examination in certified laboratories and proceed with the final IHM report
- After IHM report is completed, the owner must request from the vessel's classification society to validate and authorize the IHM report
- Upon completion of the approval by the vessel's classification society, a surveyor shall be arranged in order to conduct the initial Inventory of Hazardous Materials survey and issue relevant certification, lasting for 5 years

There are 3 parts of the Inventory of Hazardous Materials (DNV, 2022). The first part refers to the certification of either a newbuilding vessel or a vessel already in service. This certificate shall always be onboard and shall be updated when necessary. The IHM parts 2 and 3 are mandatory only once a vessel is heading to recycling. Below figures indicate the European Union's SRR Annex I and II the hazardous materials for examination (European Parliament, 2013):

ANNEX I

CONTROL OF HAZARDOUS MATERIALS

Hazardous Material	Definitions	Control measures
Asbestos	Materials containing asbestos	For all ships, new installation of materials which contain asbestos shall be prohibited.
Ozone-depleting substances	Controlled substances defined in Article 1(4) of the Montreal Protocol on Substances that Deplete the Ozone Layer, 1987, listed in Annexes A,B,C or E to that Protocol in force at the time of application or interpretation of this Annex. Ozone-depleting substances that may be found on board ships include, but are not limited to: Halon 1211 Bromochlorodifluoromethane Halon 1301 Bromotrifluoromethane Halon 2402 1,2-Dibromo-1,1,2,2-tetrafluoroethane (also known as Halon 114B2) CFC-11 Trichlorofluoromethane CFC-12 Dichlorodifluoromethane CFC-113 1,1,2-Trichloro-1,2,2-trifluoroethane CFC-114 1,2-Dichloro-1,1,2,2-tetrafluoroethane CFC-115 Chloropentafluoroethane HCFC-22 Chlorodifluoromethane	New installations which contain ozone-depleting substances shall be prohibited on all ships.
Polychlorinated biphenyls (PCB)	'Polychlorinated biphenyls' means aromatic compounds formed in such a manner that the hydrogen atoms on the biphenyl molecule (two benzene rings bonded together by a single carbon-carbon bond) may be replaced by up to ten chlorine atoms	For all ships, new installation of materials which contain Polychlorinated biphenyls shall be prohibited.
Perfluorooctane sulfonic acid (PFOS) [1]	'perfluorooctane sulfonic acid' (PFOS) means perfluorooctane sulfonic acid and its derivatives	New installations which contain perfluorooctane sulfonic acid (PFOS) and its derivatives shall be prohibited in accordance with Regulation (EC) No 850/2004 of the European Parliament and of the Council [2].
Anti-fouling compounds and systems	Anti-fouling compounds and systems regulated under Annex I to the International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001 (AFS Convention) in force at the time of application or interpretation of this Annex.	1. No ship may apply anti-fouling systems containing organotin compounds as a biocide or any other anti-fouling system whose application or use is prohibited by the AFS Convention.

Figure 85: Control of hazardous materials, Annex I (European Parliament, 2013)

Hazardous Material	Definitions	Control measures
		2. No new ship or new installations on ships shall apply or employ anti-fouling compounds or systems in a manner inconsistent with the AFS Convention.

(1) Not applicable for ships flying the flag of a third country.
(2) Regulation (EC) No 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC (OJ L 158, 30.4.2004, p. 7).

Figure 86: Control of hazardous materials, Annex I-b (European Parliament, 2013)

ANNEX II

LIST OF ITEMS FOR THE INVENTORY OF HAZARDOUS MATERIALS

1. Any hazardous materials listed in Annex I
2. Cadmium and Cadmium Compounds
3. Hexavalent Chromium and Hexavalent Chromium Compounds
4. Lead and Lead Compounds
5. Mercury and Mercury Compounds
6. Polybrominated Biphenyl (PBBs)
7. Polybrominated Diphenyl Ethers (PBDEs)
8. Polychlorinated Naphthalenes (more than 3 chlorine atoms)
9. Radioactive Substances
10. Certain Shortchain Chlorinated Paraffins (Alkanes, C10-C13, chloro)
11. Brominated Flame Retardant (HBCDD)

Figure 87: List of items for the inventory of hazardous materials, Annex II (European Parliament, 2013)

4.7.15 INTERNATIONAL TONNAGE CERTIFICATE

The international tonnage certificate is a required certification which came into force after the International Convention of Tonnage Measurement of Ships, in 1969 (IMO, 2022). The scope of the convention back in 1969, was to create a universal formula in calculating the tonnage of each vessel. Before the convention, there were many variations in calculating a vessel's tonnage and the ports could not verify if the stated tonnage of each vessel depicts the vessel's real tonnage. In order to minimize the variations of the tonnages for each vessel, the convention decided that all merchant vessels shall have their tonnage calculated by an independent authority and in this case, the convention itself. The tonnage measurement is used to calculate the charges of the port dues, the taxes of a shipping company and also the determine the minimum safety guidelines of vessels, due to the fact that all certificates are valid for a determined gross tonnage unit and above or below.

The gross tonnage is a calculation based on the sum of every enclosed space's volume on a vessel. In a gross tonnage calculation, all spaces are considered, such as the bridge, the emergency generator room, accommodation decks, funnel and hatch covers. Once all enclosed spaces that are not used for "revenue earning" are deducted from the gross tonnage, then the calculation determines the net tonnage. Therefore, the gross tonnage includes only the cargo holds of a vessel. The international tonnage certificate is issued upon vessel's delivery (after its construction). The certificate can be amended only in case that a tonnage survey is conducted.

4.7.16 REGISTER OF LIFTING APPLIANCES

The register of lifting appliances and items of loose gear is a requirement under the provisions of the International Labor Organization's Convention No.152 (ILO Convention, 1985). The scope of the convention's regulation is to ensure that all vessels are complying with all safety precautions regarding the cargo handling appliances. Those appliances can be either ship's cargo cranes or cranes with smaller capacity, located inside the engine room area or on deck, used for the connection of the bunkering hose and provisions loading. The cargo handling appliances survey is always listed in a vessel's class status, and it is compulsory to be surveyed annually. The attending surveyor will examine thoroughly each crane's condition and wiring visually. The loose gear (web slings, hooks) of each crane is also inspected for damages or excessive wear and rust. Once every five years, the classification society's surveyor will have to witness for each vessel's crane a load test, verifying that way that the crane is still operational and under safe usage.

SWL	Test load
Up to 20 tonnes	25 per cent in excess
20 to 50 tonnes	5 tonnes in excess
Over 50 tonnes	10 per cent in excess

Figure 88: Cranes safe working load tests (ILO Convention, 1985)

The cargo handing gear initial certificate is issued once a vessel is constructed. Afterwards, the certificate shall be endorsed on an annual basis. The certification can be amended in case there is a damage on the crane. Once the damage is occurred, the vessel's owner or manager shall notify the classification society and the flag administration in time. The certificate's renewal is required on a five-year basis, along with the cargo handling gear's load testing requirement.

4.7.17 INTERNATIONAL SAFETY MANAGEMENT CERTIFICATE

The international safety management certificate came into force on 1988, under SOLAS Chapter IX ((RINA, 2022). In regulation 1 of Chapter IX of SOLAS, a brief definition is given regarding to the International Safety Management Code (ISM Code), the company, which may be either the owner of a vessel or a ship manager and each of a vessel's type covered under the ISM code.

The International Safety Management Code (ISM Code) was revised on 1st of January 2015 (ClassNK, 2015). The Code's full title is International Management Code for the Safe Operations of Ships and for Pollution Prevention. The main objectives of the ISM Code are summarized below:

"to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment, and to property." (ClassNK, 2015)

Furthermore, the ISM Code is setting minimum safety standards to each owning or managing company:

- "provide for safe practices in ship operation and a safe working environment
- assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards
- continuously improve safety-management skills of personnel ashore and aboard ships, including preparing for emergencies related both to safety and environmental protection." (ClassNK, 2015)

In order for a company to comply with the ISM Code's regulations, it has to create a safety-management system, verifying the following (ClassNK, 2015):

- Compulsory regulations are being followed, either by the vessel's crew or the personnel ashore
- All guidelines required by the flag administration, the IMO and the classification societies are being taken into consideration

If the above requirements are met, then a company owning or managing a vessel, or a fleet shall be certified for being in compliance with the ISM Code's guidelines. This certification is called Document of Compliance (DOC) and can be issued either by the Flag Administration or an authorized classification society. On the certification, the company's name, address, identification number and the owning or managing vessels' type are indicated. The Document of Compliance shall be always available onboard and in case needed, master shall provide it to the authorities requesting it (IMO, 2020). To issue a company's Document of Compliance, the company has to collect all required documentation for its safety management system and submit it to the classification society and the flag administration. Once reviewed by the authorized classification society, an interim audit shall be conducted. If the audit is successfully completed, the interim Document of Compliance is issued with one year validity. Prior to the interim Document of Compliance certification's expiry, the company shall request for the classification society to carry out an initial audit. If the initial audit is completed successfully, the company will grant a full-term Document of Compliance, valid for the next five years. The full-term Document of Compliance shall be endorsed on an annual basis (four annual audits) and after the five years validity, company shall request again to the authorized classification society for a renewal audit.

Upon receiving the Document of Compliance, the ship owning or managing company can request from an authorized by the flag administration classification society to carry out an interim audit, in order to issue the Safety Management Certificate (SMC), which will have a six-month validity. Once the six-month due date is approaching, the company can conduct the initial audit for the issuance of a full-term Safety Management Certificate (SMC), with a validity of five years. The full-term certificate shall be examined on the third year with an intermediate audit and after five years from the first issue date with a renewal audit (RINA, 2022).

4.7.18 INTERNATIONAL SHIP SECURITY CERTIFICATE

The International Ship and Port Facility (ISPS) Code came into force on 1st of July 2004, under the regulations of SOLAS Chapter XI-2, in order to set security standards to all concerned parties (company, vessel's crew, port authorities and governments) in case of a security related matter. The ISPS Code consist of 2 parts, Part A is mandatory and Part B recommendatory and applies to all vessels with a gross tonnage of 500 and above (for merchant vessels) and all passenger vessels (IMO, 2022).

To secure the vessel, the crew and the port authorities, the ISPS Code set out the following:

- Ship Security Assessment (SSA): The identification of potential threats, weaknesses and existing control measures onboard he vessel (Bureau Veritas, 2022).
- Ship Security Plan (SSP): An emergency response plan shall be always available, providing necessary actions taken by the vessel's crew and ashore personnel in case of a possible threat, such as piracy or war attacks.
- Company Security Officer (CSO): A person appointed by the ship owning or managing company, responsible for the implementation of the ship security plan and also the amendment of same in case required by the ISPS Code.
- Ship Security Officer (SSO): A person appointed by the company security officer to implement the ship security plan onboard the vessel. Usually, the ship security officer is the master of the vessel. The ship security officer shall perform on regular basis security drills with the crew and also appoint and advise the role of each member in case of an emergency, in accordance with the particular ship security plan.
- Ship Security Alert System (SSAS): The security equipment that will be needed in case of an emergency. The equipment consists of a long-range identification tracker (LRIT) and hidden alarm and alert mechanisms.

Upon all required documentation and actions completion, the company shall request from an authorized (by the flag administration) classification society to review and approve the Ship Security Assessment (SSA) and the Ship Security Plan (SSP). Once the required documentation is approved, an onboard examination will be conducted, and an interim International Ship Security Certificate (ISSC) will be issued. This certification will indicate the vessel's information and validate that the security system and equipment onboard the vessel is complying with the ISPS Code and the SOLAS Chapter XI-2 regulations. The interim certificate's valid period is six months. Prior to the interim certification's expiry date, owners or managers shall request from the classification society an initial inspection onboard the vessel and proceed, after the survey's completion, with an interim expiring date, which will be replaced by a full-term certificate, issued by the flag administration. The full-term certification issued by the flag administration has a five-year validity, endorsed only on the third anniversary date with an intermediate examination. The International Ship Security Certificate (ISSC) shall be renewed after five years from its issuance with a renewal examination (RINA, 2022).

4.7.19 MARITIME LABOUR CERTIFICATE

The Maritime Labour Certificate is a requirement under the provisions of Article V and Title 5 of the Maritime Labour Convention, in 2006. The Convention's scope is to provide protection for the seafarers' rights, generally divided into the following titles (Maritime Labour Convention, 2006):

Title 1: Minimum requirements for seafarers to work on a ship

Title 2: Conditions of employment

Title 3: Accommodation, recreational facilities, food and catering

Title 4: Health protection, medical care, welfare and social security protection

Title 5: Compliance and enforcement

Figure 89: Maritime Labour Convention's titles (Maritime Labour Convention, 2006)

Before certifying the vessel with the Maritime Labour Certificate, the attending surveyor will have to examine thoroughly all the following items:

Minimum age
Medical certification
Qualifications of seafarers
Seafarers' employment agreements
Use of any licensed or certified or regulated private recruitment and placement service
Hours of work or rest
Manning levels for the ship
Accommodation
On-board recreational facilities
Food and catering
Health and safety and accident prevention
On-board medical care
On-board complaint procedures
Payment of wages

Figure 90: Examination requirements prior certification (Maritime Labour Convention, 2006)

The surveyor who will attend onboard shall be authorized by a recognized authority and shall examine the vessel under the guidelines set out in Appendix A5-I of the Convention. Once the initial examination of all living conditions of the crew onboard the vessel is complete, the initial certification will be issued, with a six-month validity. Prior to the interim certificate's expiration date, vessel's owners or managers shall request a survey onboard for the issuance of a full-term Maritime Labour Certificate (MLC). The full-term certification has a five-year validity, and shall be endorsed by an intermediate survey, which shall be conducted between the second and third anniversary date (the date of issuance). A renewal survey must be carried out, three months prior to the certificate's expiration date.

CONCLUSIONS

In this dissertation we tried to analyze different aspects of external inspections and their relationship with shipping industry, ensuring that safety in the daily operations of a shipping company is satisfied. In addition, level of safety should be ensured both in port and vessel's operations, as well as the environmental protection and sustainability.

TMSA is the main tool used by shipping companies to determine the level of risk and one of the most predominant methods to identify the problems and suggest solutions and corrective measures. It is a tool which is related with the implementation of Safety Management Systems and tries to help the shipping companies to improve the implementation of SMS. The improvement of the effectiveness is accomplished through Continual Improvement procedure and Plan, Act, Measure, Improve steps, and the efficiency is practically measured with KPIs. The frequent update of TMSA elements allow the shipping companies to be up to date with the new risks and challenges that arise. One also conclusion which has been drawn, is that the majority of the failures and cases of risks are provoked by the human activity and the errors. Shipping companies are aware of this fact, consequently they try to develop and implement methods to decrease the risk to the lowest level. Some examples of these methods are Task Analysis, Human Error Analysis, Stop Work Authority and Behavioral Competency Systems. The role of these methods is crucial for minimizing the effects of human errors. Despite the identification of the human errors, the development of performance measurement and management systems is also required. This chain including these procedures is an appropriate element for successful implementation of TMSA. In some cases, there are deviations between the ideas, the methods and how many professionals work, not only in shipping industry, but also in different areas of economy. In order to minimize this gap, we tried to record the opinion of shipping professional regarding TMSA. It should be referred that in some aspects of TMSA there is a range of opinions, although in other aspects there is the same trend in how professionals consider many aspects of TMSA.

From 1970 to 2016 the international shipping community is moved and has achieved a significant progress to eliminate marine pollution. Although, more steps need to be made in order for more oil companies and tanker owners to be part of a coordinative initiative. US government, Chinese government and EU should enforce stricter environmental measures and laws to ensure the safety in oil transfer operation and in oil extraction. It is a fact that inspections and audits cause headache to many operators as it’s a long but also a very costly process as it prevents the vessel to depart on the schedule time. It is also an exhausting process for the crew officers of the inspected vessel who sometimes face more than one inspection. For this reason, financial benefits, such as reduction in port dues, canals or promotion to charterers and clients are essential and will motivate more companies to contribute in this global initiative.

As evidenced through this dissertation, Port State Control is a key component and a vital element of shipping. The Port Authorities attach great importance to the enforcement and application of international standards for ship safety. It is clear that they are investing time and money in improving the Port State Control regime in order to harmonized approach to inspections and detention and to analyze the targeting of ships for inspections based on a ship risk profile and the company performance. All of these annual reports and evaluations are a tool for improving efficiency. Port State Control inspections prevent maritime accidents that could endanger human life and the environment. MoUs are looking for ways to make inspections more effective. Continuous inspections have managed to reduce accidents but there is still a significant percentage of accidents which cannot explain that all these strict measures and cannot predict an accident. The only logical explanation is that the inspections are done on the wrong ships. In addition, we cannot exceed the target factor which is different for each MoU. To address these problems, it is proposed a better organization of databases with more information and more accurate, better training of PSCOs and a better communication and coordination between MoUs.

The classification societies have a mandatory role in the maritime community. Apart from constantly improving the sustainability of the vessels and subsequently contribute to the protection of the environment, they also preserve the safety of human life at sea. Nowadays, it is imperative for a merchant vessel to sail with the required certification. The lack of one certificate can lead to major issues, not only for the vessel itself, but also for all the parties involved (owner, charterer, underwriter). It is therefore crucial for the vessel, the personnel ashore and onboard to comply with the classification society’s rules and instructions.

All external inspections such as TMSA, Vetting, Port State Control and Class surveys are all equally important, but each kind of inspection must be conducted separately and never in combination with each other. As has been mentioned before a maritime accident has an impact on economic, political, personal, environmental level. For this reason, full attention should be given to every inspection.

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APPENDIX

All the samples based on the Paris MoU for convenience. This does not mean that the other memoranda are not important.

Form A

Paris MoU on Port State Control	REPORT OF INSPECTION IN ACCORDANCE WITH THE PARIS MEMORANDUM OF UNDERSTANDING ON PORT STATE CONTROL*
	FORM A
[reporting authority]	
[address]	
[telephone]	
[email]	
[website]	

SHIP PARTICULARS					
Name		IMO number		Gross tonnage	
Flag		MMSI Number		Old Tonnage	
Type		Date keel laid/ Major conv.		Main engine (KW):	
Call sign		Deadweight		Emission Abatement method	

ISM COMPANY					
Name				IMO Company number	
Address		City		Country	

MLC SHIPOWNER					
Name					
Address		City		Country	

CHARTERER *(only ships carrying liquid or solid cargoes in bulk, pref. 1st charterer record)*					
Name					
Address		City		Country	
☐ **Demise Charter**	☐ **Time Charter**	☐ **Voyage Charter**			
Name and signature of master to confirm the receipt of the inspection report and to certify that the information on charterer is correct:					
Name		Signature			

Classification Society(ies) responsible for issuance of class certificates					
Issuing entity		date of issue		date of expiry	
Issuing entity		date of issue		date of expiry	

Recognised Organization (s) responsible for issuance of certificates on behalf of the flag State	
Issuing entity	
Issuing entity	

*) This inspection report has been issued solely for the purpose of informing the master and other port States that an inspection by the port State, mentioned in the heading, has taken place. This inspection report cannot be construed as a seaworthiness certificate in excess of the certificates the ship is required to carry.

Page **1** of ...

Paris MoU on Port State Control

REPORT OF INSPECTION IN ACCORDANCE WITH THE PARIS MEMORANDUM OF UNDERSTANDING ON PORT STATE CONTROL

FORM A

Name of ship		IMO number		Date of report		Place of inspection	

INSPECTION PARTICULARS[1]			
Date of first visit		Place of inspection	
Date report		If detained: Date of issue of detention notice	

Type of inspection			
☐ Initial inspection	☐ More detailed inspection	☐ Expanded inspection	☐ CIC

Operational control *(if any)*	Additional comment
☐ Abandon ship drill	
☐ Fire drill	
☐ Damage control drill	
☐ Enclosed space entry drill	
☐ SOPEP drill	
☐ SMPEP drill	
☐ Emergency steering drill	
☐ MOB drill	
☐ Rescue boat drill	
☐ Other *(specify)*	

Areas inspected	Additional comment
☐ Accommodation and galley	
☐ Ballast tank(s) from manhole	
☐ Ballast tank(s) internal	
☐ Cargo area	
☐ Decks and forecastle	
☐ Engine room	
☐ Navigation bridge	
☐ Passenger spaces	
☐ Steering-room	
☐ Vehicle deck	

[1] Masters, Shipowners and/or Operators are advised that detailed information on the inspection will be reported to the appropriate authorities and organisations and is subject to publication.

Paris MoU on Port State Control

REPORT OF INSPECTION IN ACCORDANCE WITH THE PARIS MEMORANDUM OF UNDERSTANDING ON PORT STATE CONTROL

FORM A

Name of ship		IMO number		Date of report		Place of inspection	

RELEVANT CERTIFICATES

				information on last intermediate, periodical or annual		
Title certificate	**issuing authority**	**date of issue**	**date of expiry**	**date of survey**	**surveying authority**	**country**

INSPECTION ACTIONS

Ship related inspection action taken *(if any)*	Additional comment
☐ Inspection suspended	
☐ Dismissed on AFS grounds	
☐ Excluded on AFS grounds	
☐ Ship expelled on security grounds	
☐ Ship expelled on other grounds	
☐ MARPOL investigation	

Page **3** of ...

Paris MoU on Port State Control

REPORT OF INSPECTION IN ACCORDANCE WITH THE PARIS MEMORANDUM OF UNDERSTANDING ON PORT STATE CONTROL

FORM A

Name of ship		**IMO number**		**Date of report**		**Place of inspection**	

Ship related reporting action taken *(if any)*	Additional comment
☐ Flag State informed	
☐ RO informed	
☐ Next port informed	
☐ Coastal State informed	
☐ ILO informed	
☐ Shipowner & seafarer organisation informed	
☐ Shipowners organisation informed	
☐ Union representative informed	
☐ Flag state requested to submit action plan within	
☐ Other authority informed	
☐ Overriding factor	
☐ Observations to inspection	

DEFICIENCIES	☐ **no**	☐ **yes** (see attached FORM B)
OUTSTANDING DEFICIENCIES[1]	☐ **no**	☐ **yes** (see attached copy of FORM B from previous inspection(s))
SUPPORTING DOCUMENTATION	☐ **no**	☐ **yes** (see annex)

PORT STATE PARTICULARS			
Head office/District office		Telephone	
Address		E-mail	
		Website:	

Name(s) of duly authorized PSCO('s) of reporting authority)	***signature***	***visit date***

This report must be retained on board for a period of at least three years and must be readily available for consultation by Port State Control Officers at all times.

[1] "Outstanding deficiencies" are listed for information only and will not be taken into account for the calculation of the Ship Risk Profile and the Company performance.

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(https://www.parismou.org/model-forms-psc)

Form B

Paris MoU on Port State Control

REPORT OF INSPECTION IN ACCORDANCE WITH THE PARIS MEMORANDUM OF UNDERSTANDING ON PORT STATE CONTROL

FORM B

Name of ship		**IMO number**		**Date of report**		**Place of inspection**	

DEFICIENCIES FOUND AND FOLLOW UP ACTIONS

Code	Defective item	Nature of defect[‡‡]	Convention ref.	Action taken	Due date	Ground for detention	Accidental damage[§§]	RO resp.	ISM related	Additional comments
						☐	☐	☐	☐	
						☐	☐	☐	☐	
						☐	☐	☐	☐	
						☐	☐	☐	☐	
						☐	☐	☐	☐	
						☐	☐	☐	☐	
						☐	☐	☐	☐	
						☐	☐	☐	☐	
						☐	☐	☐	☐	
						☐	☐	☐	☐	

[‡‡] This inspection was not a full survey and deficiencies listed may not be exhaustive. In the event of a detention, it is recommended that a full survey is carried out. All deficiencies should be rectified before an application for re-inspection is made.
[§§] Deficiencies marked as Accidental Damage are not taken into account for calculating the company performance and the Ship Risk Profile.

(https://www.parismou.org/model-forms-psc)

Notice of detention for the Master

PORT STATE CONTROL
{Sample-National form}
NOTICE OF DETENTION FOR THE MASTER

No.

The undersigned:
duly authorized officer of the {………………... *Shipping Inspectorate}* herewith notifies you that
the ship: "……………………………………… " , callsign:…………………………………………………… ,
IMO number:……………………………………… , gross tonnage:…………………………………………… ,
port of registry:…………………………………… , flagstate: ……………………………………………………,
type of ship:……………………………………… , date on which keel was laid:……………………………… ,
owner:……………………………………………… , master:………………………………………………………… ,
agents:……………………………………………… , classification society/RO:……………………………,
berthed at: ……

has been detained in accordance with the provisions of article {..} of the {……………..…} Port State Control Act (Official Collection, 19.., no. ….),

on account of:

- ☐ one or more of the criteria for detention set out in Annex X of Council Directive 2009/16/EC of 23 April 2009 (Official Journal of the European Communities No L 131);
- ☐ crew members being unable to provide proof of professional proficiency for the duties assigned to them as mentioned in article 12 of Council Directive 2008/106/EC of 19 November 2008 (Official Journal of the European Communities No L 323);
- ☐ master or crew unable to comply with operational requirements as contained in the Conventions mentioned in article {..} of the Port State Control Act;
- ☐ other deficiencies which, individually or together, are clearly hazardous to safety, health or environment;
- ☐ the fact that the Port State Control Officer was obstructed in the execution of his duty.

For further details see the Report of Inspection forms A & B enclosed to this notice for the master.

In accordance with the provisions of article {..} of the Port State Control Act it is prohibited to shift the ship to another berth without the prior consent of the Port State Control Officer, or to proceed to sea without a proper Notice of Release of ship from detention.

Place: Date:

The above mentioned officer:

Appeal p.t.o.

(https://www.parismou.org/model-forms-psc)

Notification of detention of ship

Paris MoU on Port State Control

PORT STATE CONTROL
{Standard}
NOTIFICATION OF DETENTION OF SHIP*

Flag State / Consulate
Classification society/recognised organization
Fax no.
E-mail

Number of pages, incl. this

Dear Sir / Madam,

[Ship's name, flag, IMO No.] – Detention of ship

The .... Maritime Authority have on [date] carried out an inspection of the above ship at [Port, country].

The ship is detained at [time of detention] hours due to the following detainable deficiencies :

1. ....
2. ....
3. ....
4. ....
5. ....
6. ....
7. ....
8. ....
9. ....
10. ....

Enclosed please find a copy of the Report of inspection forms A & B and the Notice of detention for the Master**.

For further inquiries, please contact: [Name and contact details]

Yours faithfully,

* As per IMO-MSC/Circ.1011 and MEPC/Circ.383
** Issued per national legislation requirements.

(https://www.parismou.org/model-forms-psc)

Notification of release of ship

PORT STATE CONTROL
{Standard}
NOTIFICATION OF RELEASE OF SHIP*

Flag State / Consulate
Classification society/recognised organization
Fax no.
E-mail

Number of pages, incl. this

Dear Sir / Madam,

[Ship's name, flag, IMO No.] – Release of ship

The .... Maritime Authority have on [date] carried out a re-inspection of the above ship at [Port, country].

The ship was released at [time of release] hours.

[Insertion of free text, if any]

Enclosed please find a copy of the Report of inspection forms A & B.

Yours faithfully,

* As per IMO-MSC/Circ.1011 and MEPC/Circ.383

(https://www.parismou.org/model-forms-psc)